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MODEL AIRPLANE NEWS

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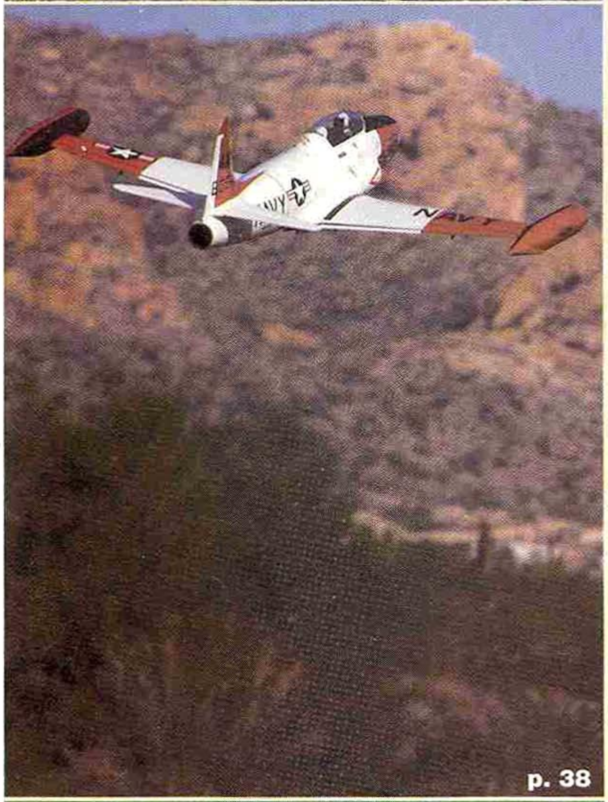

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ON THE COVER: Mike Kulczyk is just about to set his scratch-built Yak-15 down at the Arizona Jet Rally (photo by Larry Marshall). Inset: Phillip Kent's 76-inch-wingspan Nicholas Beazley is our construction article this month.

ON THIS PAGE (top to bottom): U.S. AirCore's F-16 is a quick way to get into modern sport-scale aircraft; Balsa USA's 1/3-scale Super Cub; Mike Shoemaker's Jet Model Products T-33 takes off at the Arizona Jet Rally.

by LARRY MARSHALL

WHAT IS A WARBIRD?

Everybody likes warbirds. If you ask the guys at a jet rally what a warbird is, they'll tell you it's a jet fighter and point to F-86s, F4s, F-15s, F16s and T-33s. The IMAA warbird meets have different definitions of warbirds, depending on which one you attend. But all of them, because they're IMAA meets, require minimum 80-inch wingspans on monoplanes and 60 inches on biplanes. All require that the aircraft be of military type and in military markings. Some further restrict the definition by date, e.g., WW II aircraft. At the Rhinebeck Jamboree, a warbird takes its definition from the Sopwith Pups, Fokker Dr.Is and Bristol Scouts that strafe the Aerodrome during that special weekend in September. But if you attend one of the Scale Masters Qualifiers or the Masters itself, it's possible to see examples of all these other warbird definitions, each with its own competition virtues and limitations.

When you get a bunch of warbird aficionados together, it isn't long before someone points out that there are actually two kinds of warbirds: there are fighters and there are targets. This is said with the view that fighters reign supreme but, of course, we know that it is bombers that deliver the war to the enemy's home turf, reconnaissance aircraft that establish target location and transport aircraft that provide the goods and personnel that keep the military machine functional. Nevertheless, it was the fighters that excited us as kids, and it's fighters that excite us as big kids.

Each war seems to have its "special" bird that is far more popular than any other. When it comes to favorite models, the Fokker Dr.I wins hands down as the WW I favorite, in spite of the fact that few of the real thing actually flew. The WW II favorite is the P-51, which has to be right up with the Piper Cub as the most kitted. I think it's safe to say that the F-86 is the favorite from the Korean War, and the F-4 Phantom surely takes top honors for most often modeled from the Vietnam era.

But whatever your definition of a warbird is and whether you fly fighters

or targets, you should know about a new organization created by Dino DiGiorgio. Called the World Miniature Warbird Association, its purpose is to promote the flying of warbirds. Dino defines a warbird as any aircraft used by the military, and any scale model is a warbird if it's military and is finished with proper military markings. Dino's thought was that those who enjoy flying warbirds needed an organization, with a newsletter, that would bind them together and give them a mechanism to communicate and share their modeling successes. The current list of members is already a veritable who's who of modelers, indicating what other folks think of Dino's idea. To join, contact World Miniature Warbird Association Headquarters, P.O. Box 175, Succasunna, NJ 07876.

Whether you join or not, you should make every effort to take part in the first event organized under the WMWA banner. Don Godfrey is working with Dino to put together a very unique warbird meet. It will have no size restrictions and no type restrictions. If you have a military plane in military markings, you can fly it at the first IMWA meet. The meet will be held on June 5 through 7 at the Kirkwood Airpark, 2432 Rte. 11 South, Kirkwood, NY 13795. You don't have to be a WMWA member to attend. You can contact Dino for more info at DinoD999@aol.com; (973) 584-6096. See you there.

ARIZONA JET RALLY AND NICHOLAS BEAZLEY

I had the opportunity to attend the 9th Annual Arizona Jet Rally; these guys put on a good show. The meet is put on by one of the nicest bunch of modelers I've ever run into—the Arizona Model Aviators. The variety of jets showing up from all over the Southwest for this event was mind-boggling. I just hope my camera grabbed a bit of the feel of the event as well as photos of some of the beautiful jets that flew that weekend.

We've all heard of Cessna, Piper, Curtiss, Rearwin and many of the other small plane manufacturers that grew on the wave of the Golden Age of aviation. Other companies, like Cairn, Spartan, Arrow and Nicholas Beazley are much less known but nevertheless produced some fine flying aircraft during a very special period in aviation. This month, we're fortunate to bring you a Phillip Kent construction article on the Nicholas Beazley NB4, a unique three-seat monoplane. Hope you like it.

Air SCOOP

by CHRIS CHIANELLI

New products or people behind the scenes; my sources have been put on alert to get the scoop! In this column, you'll find new things that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares? It's you, the reader, who matters most! I spy for those who fly!

The Lightest ZAGI of All

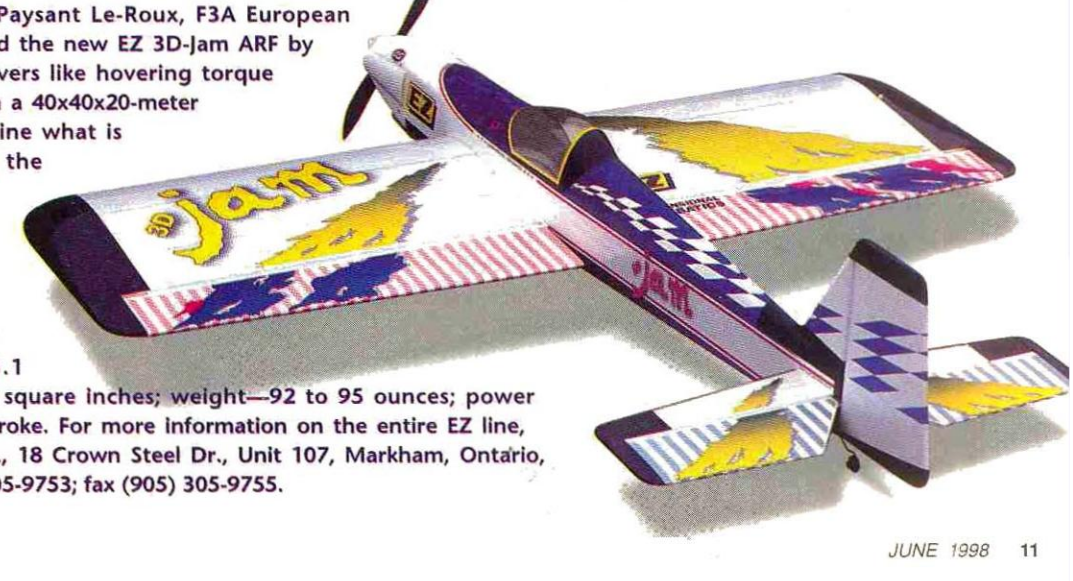
According to Trick R/C Products, the ZAGI-THL thermal/hand-launch flying wing incorporates the latest in "foam-tech" technology. This new, super-light ZAGI features a resilient, expanded-polypropylene (EPP) foam leading edge that's laminated to a rugged, 1-pound white foam-core that is covered with 2.4-mil poly tape—a combat-proven construction technique that's light, durable and cheap. The new ZAGI-THL retains the low-drag profile of the old ZAGI-LE. Flying weight is 11.4 ounces, yielding an unbelievable wing loading of only 4 ounces/square foot.

This new version is reported to deliver aerobatic agility and a wide speed envelope. It flies well in light slope lift at 5mph and also penetrates in 25mph winds. At a price of only $45, the ZAGI-THL sounds like a rugged, lightweight wing that's hard to beat. Specs: wingspan—48 inches; wing area—408 square inches; airfoil—ZAGI 12/5; radio required—4-channel with mixer; speed range—5 to 25mph. For more information, contact Trick R/C Products, 938 Victoria Ave., Venice, CA 90291; phone/fax (310) 301-1614; website: http://www.Zagi.com.

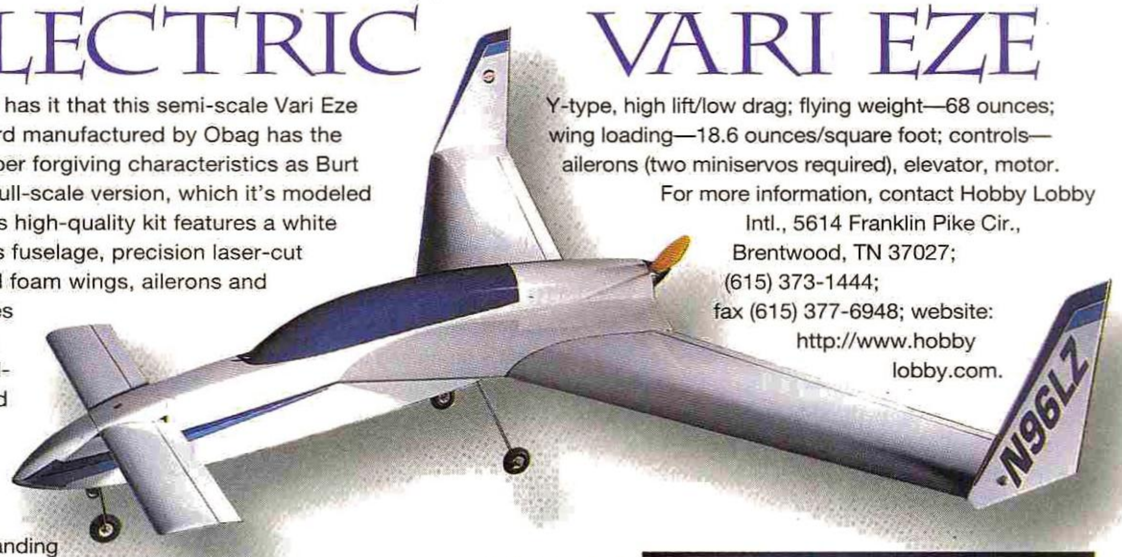
EZ LINE RETURNS

Remember those super-high-quality ARFs manufactured by OK Model Co. Ltd. in Osaka, Japan? That's right; EZ ARFs. Well, OK are back, and here are two of their latest products. The Profile Space Shuttle ARF has a true delta-wing planform, so it's capable of realistic, nose-high landing approaches. The Space Shuttle may be the easiest EZ of all time, considering OK's stated building time of only a few hours. Specs: length—37.5 inches; wingspan—27.5 inches; wing area—529 square inches; weight—1.75 pounds; power required—.10 2-stroke.

France's Christophe Paysant Le-Roux, F3A European Champion, demonstrated the new EZ 3D-Jam ARF by performing wild maneuvers like hovering torque rolls and rolling circles in a 40x40x20-meter indoor space. Just imagine what is possible outdoors! Like the Space Shuttle, the 3-D Jam can be assembled quickly and includes a very complete, high-quality hardware package. Specs: length—57.4 inches; wingspan—53.1 inches; wing area—859 square inches; weight—92 to 95 ounces; power required—.40 to .45 2-stroke. For more information on the entire EZ line, contact Magma Intl. Ltd., 18 Crown Steel Dr., Unit 107, Markham, Ontario, Canada L3R 9X8; (905) 305-9753; fax (905) 305-9755.



ELECTRIC VARI EZE FROM HOBBY LOBBY



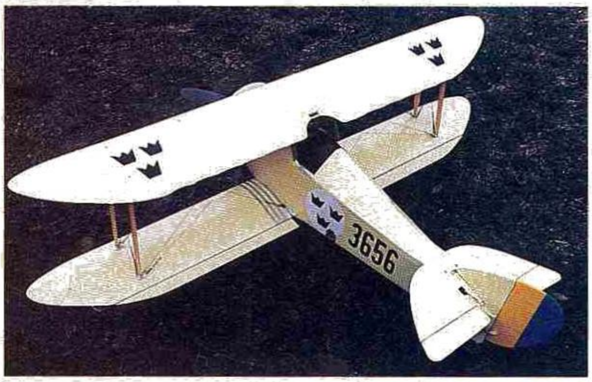
Rumor has it that this semi-scale Vari Eze canard manufactured by Obag has the same super forgiving characteristics as Burt Rutan's full-scale version, which it's modeled after. This high-quality kit features a white fiberglass fuselage, precision laser-cut parts and foam wings, ailerons and foreplanes (sheeted with hardwood and sanded). The kit also includes wheels, landing gear and a wing-mounting system. According to its distributor, Hobby Lobby Intl., the Vari Eze can be assembled quickly and easily because of its excellent engineering and parts fit. Specs: wingspan—55.9 inches; wing area—527 square inches; airfoil—Clark Y-type, high lift/low drag; flying weight—68 ounces; wing loading—18.6 ounces/square foot; controls—ailerons (two miniservos required), elevator, motor.

For more information, contact Hobby Lobby Intl., 5614 Franklin Pike Cir., Brentwood, TN 37027; (615) 373-1444; fax (615) 377-6948; website: http://www.hobbylobby.com.

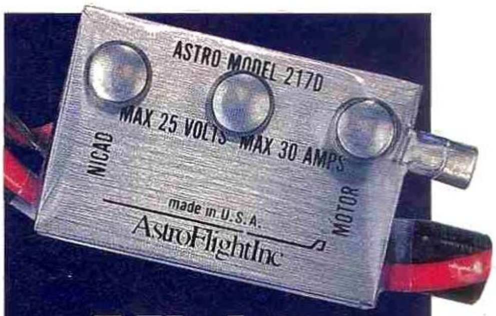
Laser-Cut ½A Kits

Known for its laser-cutting expertise, Herr Engineering now offers the Aqua Star seaplane and AT6-Texan. Both models call for .049 to .061 power and feature: laser-cut parts; quick, easy and accurate tab-and-notch construction; 3D CAD design for precision fit; computer-drawn plans; high-quality hardware pack; peel-and-stick markings; and a complete step-by-step instruction manual. The Aqua Star boasts excellent water takeoff and landing characteristics and easy touch-and-go's, even on the smallest ponds. Remove the wingtip floats, and the Aqua Star is quickly converted for land operation. The Texan is great for sport/scale flyers and ½A class AT-6 racers. Aqua Star specs: wingspan—40.5 inches; wing area—245 square inches; weight—19 ounces; wing loading—11 ounces/square foot. Texan specs: wingspan—36 inches; wing area—190 square inches; wing loading—14.4 ounces/square foot. Both models call for 2- to 4-channel radio control. For more information, contact Herr Engineering Corp., 1431 Chaffee Dr., Ste. 3, Titusville, FL 32780; (407) 264-2488; fax (407) 264-4230.

Early Bird ARFs



Thanks to 3 Sea Bees Models, the era of flying wires and fabric can be yours in a matter of hours. That's right; the models you see here—and others, such as the Blériot, Pfalz E1 and Thomas Morse Scout—are now available in ARF, ARC (almost ready to cover) and static-display-only RNF (really not flyable?) forms. Designed and handcrafted in Sweden, these high-quality (I've taken an up-close look for myself) ⅕-scale models feature: flying wires, wing warping (where applicable), under-cambered wing sections, dummy engine, static prop, documentation and manual. Rumor has it, a Newport 17 is on the drawing board. Prices for these beauties are reported to be very reasonable, considering the complexity of the subjects. For more information, contact 3 Sea Bees Models, P.O. Box 747, Lake Stevens, WA 98258; (425) 334-6089; fax (425) 397-2126.



Mighty Mini

Designed for sport-type airplanes, Astro's diminutive 217D features opto-coupling that makes it resistant to motor RF noise, plus it can handle up to 25 volts or 16 cells and motors as large as an Astro 25 Cobalt. The 217D incorporates eight-bit digital microprocessing that operates at a switching rate of 2800Hz, making it very efficient at partial throttle settings. The two MOSFETS in the motor drive circuitry have a combined resistance of less than 6 milliohms. This low resistance lets the unit run cool while supplying a continuous current of up to 30 amps. Other features include: safe start, which requires a 1-second off-throttle command for start-up, and built-in diode switching instead of external switching. For more information, contact AstroFlight Inc., 13311 Beach Ave., Marina Del Rey, CA 90292; (310) 821-6242; fax (310) 822-6637.

AIRWAVES

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News,** 100 East Ridge, Ridgefield, CT 06877-4606; email **man@airage.com**. Letters june be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we can not respond to every one.

GOBLINS AND BEC RECEIVERS

Larry, I am an avid R/C modeler who has a budding interest in electrics. I just want to say thanks for writing such great articles. They are extremely helpful.

I have some questions regarding choice of speed controllers. There are just so many out there that I don't even know where to start. From asking around, I get so many different answers—half of the time from store people I feel are speaking without experience.

I am trying to build the Goblin (an electric sailplane-ish aircraft that was presented in the July 1997 issue of *Model Aviation*). The author talks of using a BEC receiver and mentions nothing about a speed controller except that "... one should use the motor only in a full-on/full-off configuration because otherwise the drain is prohibitive." Everything is cryptic to me. So my questions are:

1. If I choose a speed controller with BEC, does the receiver also have to be BEC?
2. Why is drain prohibitive if a proportional throttle is used?
3. How do I choose a speed controller? (The Goblin is a V-tailed model with a wingspan of 46 inches, Speed 400 motor with a 1.72:1 gearbox and either 6 or 8 cells.)
4. Can a V-tail plane be flown with only one servo hooked up to both tail-feather control surfaces? In the past, I have seen two servos somehow hooked up to both control surfaces. This model has its tail-feather control surfaces controlled by a single servo hooked directly to both surfaces via a solid split-Y control rod; will it work?

BENJAMIN JWO SONG
University of Michigan

Thanks; glad you liked the columns. I'm a bit overwhelmed by the response; thanks to all you folks who've written to me.

The term "BEC receiver" is a jargon problem as there's no such thing as a "BEC receiver." The author is talking about a system that has the receiver and speed controller built as one unit. These are OK for 7-cell, low-current use. And, no, the receiver doesn't have to be BEC; in fact, it makes no sense. All a BEC amounts to is a voltage regulator that taps off power from your motor battery and feeds 5 volts to the receiver just like an RX pack would do, thus eliminating the need for the RX pack. BECs are built into some speed controllers.

Regarding the statement "One should use the motor only in a full-on/full-off configuration because otherwise the drain is prohibitive"; I sympathize with your difficulty in interpretation. I suspect, though it's unclear, that the author is referring to frame-rate controllers. Most of the combined RX/ESC units are what are called "frame rate"; that is, the controller MOSFETS cycle at the same rate as the servo pulse. Without trying to provide a treatise on controller operation, that's not fast enough to efficiently provide power to a motor when the throttle is at partial throttle. Thus, the combined units make good on/off switches, but not much more.

Assuming you want a modern high-rate controller, there are three parameters of concern when choosing one. First is size: will it fit in your plane? All too much has been made of this parameter, as most controllers will fit in all but the smallest of planes. The other two parameters are current and voltage capacity. If you're going to fly a 12-cell plane and draw 30 amps, you need a controller that can handle at least that voltage and current. My advice is to check with companies that sell controllers, get the specifications for their controllers, and then make your choice. I'd advise against trying to use a car controller in an airplane. For your Goblin, the JETI-10 from Hobby Lobby is a popular controller for Speed 400 motors.

Normally, a V-tailed plane requires two servos to drive the tailplanes to provide rudder and elevator function. In the case of the Goblin, the designer chose to use ailerons on a wing with dihedral rather than rudder function. Thus, only elevator function is assigned to the V-tail, and so only one servo is required.

LM

BURNELLI PROJECT

Jim [Ryan], having read your last article in *Model Airplane News* (February '98), I hope that you can help me obtain the NACA coordinates for a Burnelli CBY-3 project that I am attempting to start. They are as follows:

Wing root: NACA 23015-64
Wingtip: NACA 23009-64
Fuselage: NACA 23020-64 (modified)

WAYNE TERPSTRA
Miramar, FL

You've chosen a very unusual project! The "lifting body" designs of Vincent Burnelli were a promising concept that was allegedly sabotaged by political intrigue, and the CBY-3 was surely the most beautiful of the series. See the Fall 1996 issue of Air Age's Flight Journal *for a more complete account of this story.*

The Burnelli designs used a wide airfoil-shaped fuselage to improve efficiency by having a greater percentage of the airframe contribute lift. According to a 1939 report signed by Gen. H.H. Arnold, the test aircraft had the lowest drag coefficient and highest lift coefficient of any type evaluated. As a side benefit, they had far more internal volume and floor area than conventional designs, making them ideal cargo aircraft.

Interestingly, most modern fighter aircraft use lifting fuselages, and

AIRWAVES

several aircraft companies are studying "blended-wing-body" (BWB) designs for large passenger airliners, so in the long run, Burnelli's theories have proved their worth.

I mailed you a set of the requested foil sections, and the Flight Journal *article is available as a back issue from Air Age at (800) 827-0323. Please note that over 1,100 other foil sections are available for download from the UIUC Applied Aerodynamics website: www.uiuc.edu/ph/www/m-selig. For more information on Burnelli designs, you can contact Chalmers Goodlin, president of the Burnelli Co. Good luck with your project!* JIM RYAN

SCHOOLYARD ELECTRICS

Larry, I really enjoyed your new column in *Model Airplane News* (March 1998). It got me thinking about taking advantage of the five schoolyards in my immediate area, as opposed to the 15-mile drive to my regular flying field! The clear and simple way you express the information is a great help to those of us just beginning to think of electric power for our aircraft.

I was interested in your two examples on page 98. OK, we can power the plane for 6 minutes at full throttle, but how do you get longer flights?

I see that conversion of glow models to electric is a future subject, but I was wondering if you could recommend some books that would provide information (in an understandable format!!) that might help me now. I was thinking along the lines of a 40-size trainer, possibly a Tiger Trainer 40, for this project. I know an ARF is not ideal, but I do have reasons.

One of my primary goals, besides being able to sneak in some flying when time would otherwise prohibit it, is to recruit more folks for our hobby. I have found that ARFs appeal to many who are unsure of their building skills or who just don't have the time! They are also afraid of spending many hours building an airplane only to see it crash at some point. They are much less afraid of crashing an ARF.

The setup of clean, quiet, electric power with a quick-building, semi-expendable ARF is a powerful inducement to try R/C. Can you tell I carry membership applications in my flight box?

Thanks for the excellent column! Please keep up the good work.

DAVID KNIGHT
Round Rock, TX

Utilizing nearby fields nearly doubled my stick time when I got into electrics. It really is nice to be able to take three battery packs, a small plane and a transmitter down the street to get a few flights in before dinner.

Before you start worrying about longer flights (you get longer flights by using the left stick, by the way), go out and time your glow flights. Many of us who have done this have found that 6 to 7 minutes is pretty average for an R/C flight, regardless of power. Most guys who think they fly longer simply haven't timed their flights. The exceptions may be those who fly putt-around-the-sky types of planes, and achieving 10 minutes with this sort of airplane is a piece of cake with electrics.

ARF conversions work well, but here, due to the weight of the aircraft, duration does suffer. Still, I've seen guys drop 14-1700SCR cells and an Astro Cobalt 15G into a Hangar 9 Easy Fly 40 and get 6 minutes of flight without a problem. With Sanyo 2000SCRs, you should do a bit better.

Flying from schoolyards with .40-size ARFs may not be a good idea. Flying in a vacant field or at the local soccer field works best with hand-launch planes simply because in most cases there is no runway; soccer fields aren't typically cut close enough to take off from the ground. Thus, thinking in terms of a 6-pound, .40-size airplane, while also thinking of flying from unofficial R/C flying fields is impractical most times. More importantly, if the field is occupied by other people and houses are nearby, it becomes downright dangerous. In those instances, Speed 400-powered, 1-pound aircraft are better suited to the situation. LM

HOBBY HANGAR ERRATUM

In our KRC coverage (March 1998, page 37), a photo of a Hobby Hangar OV-10 was mislabeled as being from Hangar Hobbies. For more information on this plane, contact Hobby Hangar, 1862 Petersburg Rd., Hebron, KY 41048; (606) 334-4331.

Pilot PROJECTS

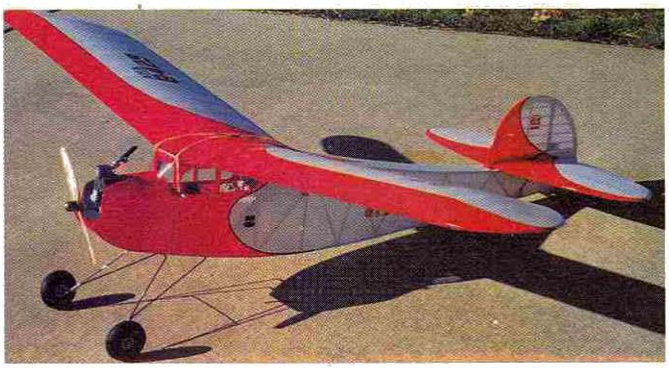
A LOOK AT WHAT OUR READERS ARE DOING

SEND IN YOUR SNAPSHOTS

Model Airplane News is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable. We receive so many photographs that we are unable to return them.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1998. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606.



OLD-TIME POWERHOUSE

Larry Katz of Toms River, NJ, sent this photo of the fourth Powerhouse he has built and tells us, "It is my all-time favorite model, and I can almost build it with my eyes closed." The 5-pound model uses an O.S. .40 for power and is covered with Micafilm.

ACE SEAMASTER

This Ace Seamaster 120 was built by Joe Messing of Simi Valley, CA. The 21-pound model is powered by a SuperTigre 2500 and has had at least 30 flights. Joe writes, "The wheels are removable, and water flights are great. I use a Futaba 8AUF and metal-gear servos."

HANDSOME HERCULES

John Ziegler of Williamsburg, VA, sent this photo of his C-130 that he built using Skip Mast's plans published in *Model Airplane News*. Two O.S. .60s (engines one and four are free-wheeling dummy props) power the model, which is made of fiberglass-covered foam. John's C-130 has a 102-inch span and weighs 18 pounds.

MEISTER MESSERSCHMITT

Tony Grazulewich of Crystal River, FL, sent this photo of his scratch-built BF 109 from Jim Meister ¼-scale plans. The 100-inch-span model is powered by a 4.2 Sachs engine, and Tony says, "It is very agile, no bad habits and very low speed landings ... a real eye-catcher both flying and sitting at the field."

NAVY SKYRAIDER

Bill Luig of Horsham, PA, built this 101-inch-span AD-6 from Ziroli plans and finished it with fiberglass and paint. The AD-6 is powered by a 4.2 Sachs engine and uses eight servos for control. In his quest to make the model as accurate as possible, Bill visited the Smithsonian's Paul E. Garber restoration facility in Suitland, MD. This photo was sent to us by Tom Haake of Richboro, PA.

SCRATCH-BUILT AEROBAT

This 35-percent Giles 202 was designed and built by Ron Kahl and is owned and piloted by Dave Pulfer of Tipp City, OH. The model is powered by a Sephar 4.6 twin engine spinning a 23x10 Menz prop. Dave writes, "This is my first big giant-scale aerobatic airplane, and I love its excellent flying characteristics."

MEET ME IN ST. LOUIS

John Cseri of Oak Creek, WI, sent this photo of his scratch-built *Spirit of St. Louis*, which has a 12-foot wingspan and weighs 30 pounds. John writes, "The airplane is a very gentle flyer."

EXTRA SPECIAL

Twelve-year-old Rick Suffoletta of Georgetown, KY, recently finished building his first R/C airplane—this Extra Lite dressed in P-36 colors. A 20-year-old Webra Speed .40 (borrowed from dad) and a JR radio keep the Extra on track at the family's farm.

MOLTO MACCHI

Isacco Vallerugo Scarton of Udine, Italy, sent this photo of his friend's MC 205 that he recently test-flew. Athos Facile built the 100-inch-span, 30-pound model and equipped it with a SuperTigre 4500 engine. Isacco says that the plane flew realistically.

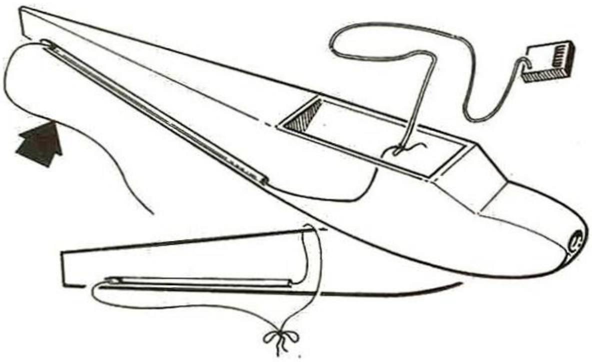
GIANT BEAVER

This 12-foot-span de Havilland on floats is the handiwork of Ernest Harbin of Flushing, MI. Ernest writes, "My good friend Ted Weeks drew up the plans and partially built it and then gave it to me to finish." The Beaver weighs 48.5 pounds and sports a Zenoah G-62 in its nose. Ernest used MonoKote to create the Kenmore Air Harbor color scheme.

Hints & KINKS

by JIM NEWMAN

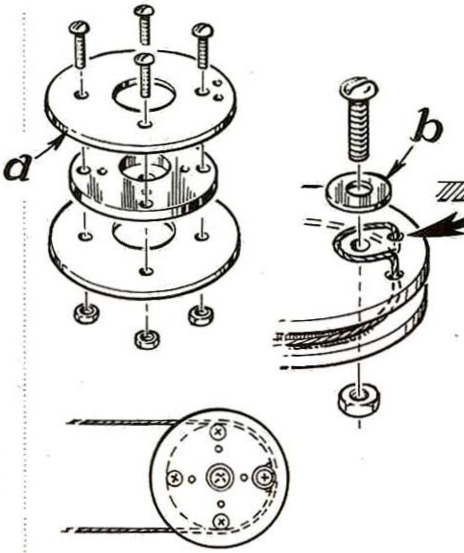
Model Airplane News will give a free one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.



STRIKE A CORD

If you regularly switch a receiver between models, tie a long thread (arrowed) to the end of the antenna so that it may be pulled out through the antenna conduit. When you untie the thread from the antenna, temporarily tie the two ends of the thread together so that you can pull the antenna back through the conduit.

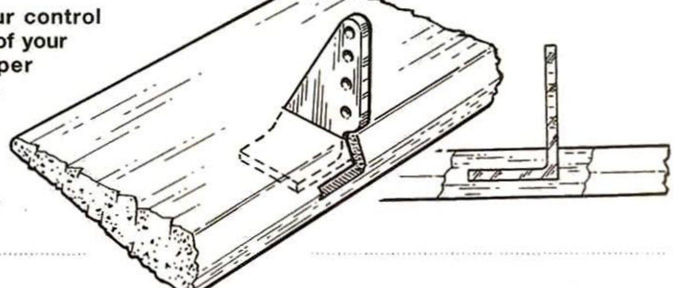
Ralph Brehmer, Cape Coral, FL



PULL/PULL PULLEY

Screw two large fender washers (a) to a servo wheel as shown, trapping the pull/pull cable under a washer (b) to lock it in place. The cross-section shows how the holes should be beveled top and bottom to avoid damaging the cable. The pulley provides a constant moment to the leverage, which is good for cable systems.

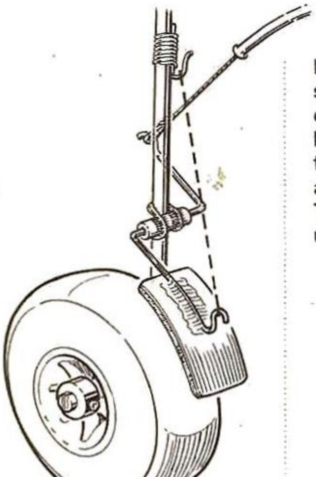
Michael Lawson, Friendsville, TN



NEATER HORNS

Rout or cut an L-shape slot in your control surface, then scuff the gluing areas of your control horn with coarse sandpaper before gluing it into the slot. Be sure the pushrod holes are vertically above the axis of the hinge pins. This technique ends the use of unsightly screws.

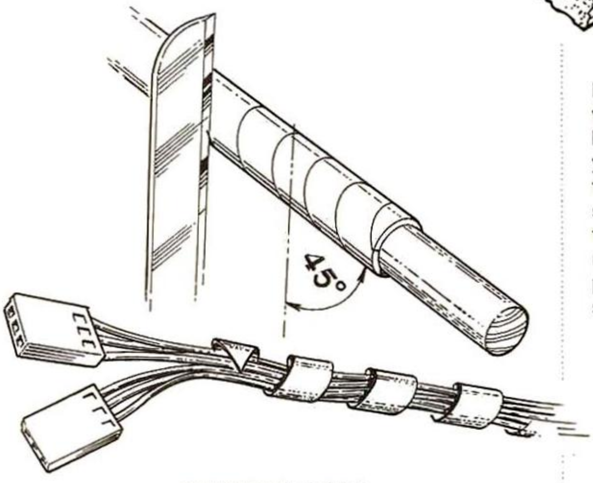
Bob Noll, Vestal, NY



TIRE PLONKER

Here's a simple and effective nose-wheel brake. A brass bushing is bound to the leg with soft wire and then soldered. Face the tinplate shoe with rubber or cork, and hold it in the "off" position with a light rubber band (shown by dashed line). The cord goes to the elevator servo so that holding full down applies the brake.

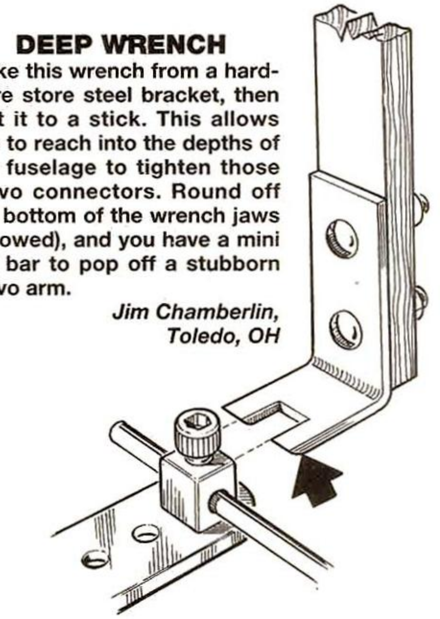
Bob Robert, Durrington, Wiltshire, England



CABLE LOOM

Slide a dowel into a plastic drinking straw, then make a 45-degree spiral cut along the length of the straw. Wrap the slit straw around bundles of wire to make a neat and easily separated loom.

Robert Goodwin, Chicago, IL



DEEP WRENCH

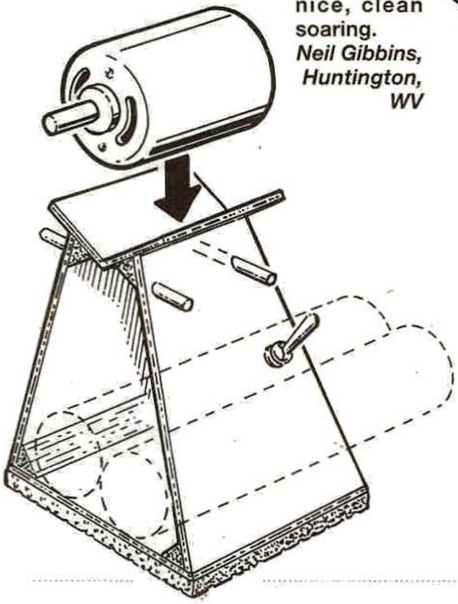
Make this wrench from a hardware store steel bracket, then bolt it to a stick. This allows you to reach into the depths of the fuselage to tighten those servo connectors. Round off the bottom of the wrench jaws (arrowed), and you have a mini pry bar to pop off a stubborn servo arm.

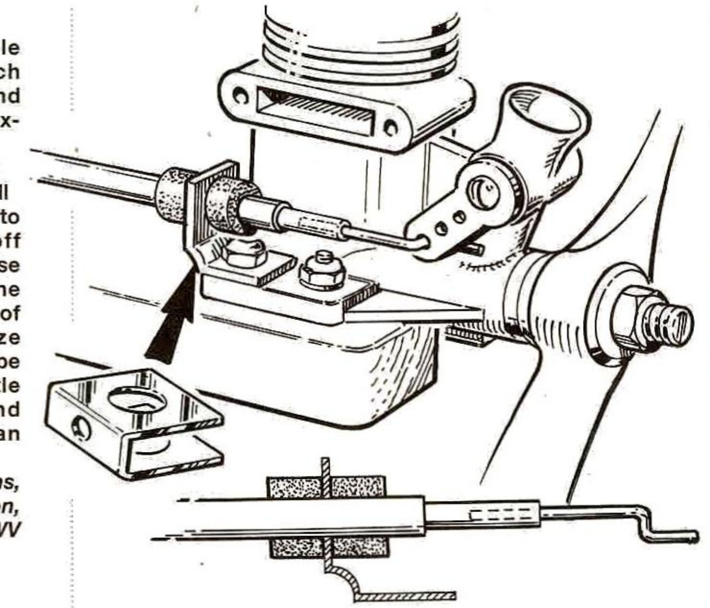
Jim Chamberlin, Toledo, OH

A TASTE OF ELECTRIC

To try electrics, make this simple pod from 1/16-inch (1.5mm) birch plywood, balsa triangle stock and 3/16-inch (5mm) dowels. Strap an inexpensive, .05 can motor into the vee with rubber bands, use Velcro®-brand fastener to install a 6- or 7-cell pack inside the pod, and connect it to the motor using a simple on/off switch. Soft rubber glued to the base will conform to the wing when the assembly is "banded" to the top of your Gentle Lady or similar size glider. Neil says it is not meant to be a rocket, but you will enjoy gentle climbs and nice, clean soaring.

Neil Gibbins, Huntington, WV





CABLE CLIP

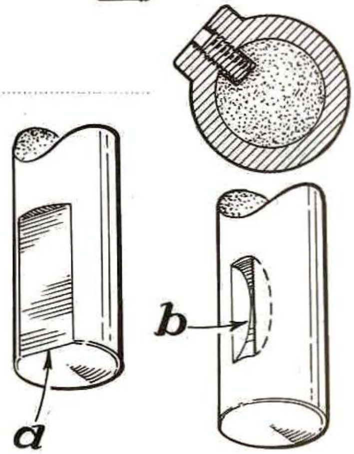
An auto-parts door-trim clip makes an ideal throttle-cable mount when it is opened up and trapped under a mounting bolt. The pushrod tube is secured with two slices of rubber vacuum hose—works great on profile R/C models.

N. Froude, Fairlie, New Zealand

POSITIVE LOCK

The usual method of retaining sprung gear legs on retracts is to file a flat (a), but that's not very effective, since a gear leg can be twisted out of line. Instead, use a small Dremel grinder to cut a slot (b) that is a close fit around the setscrew. If the screw becomes loose, the leg won't twist or fall off.

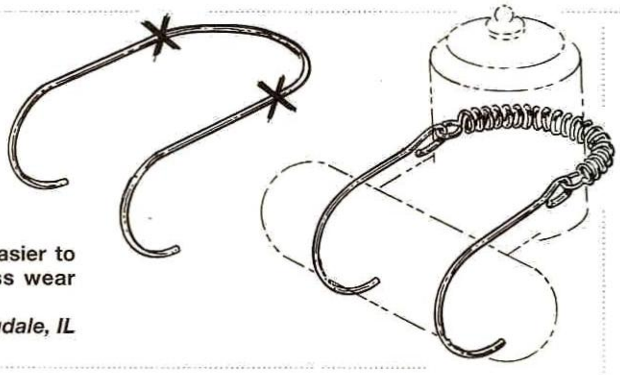
Bob Lineberger, Columbia, SC

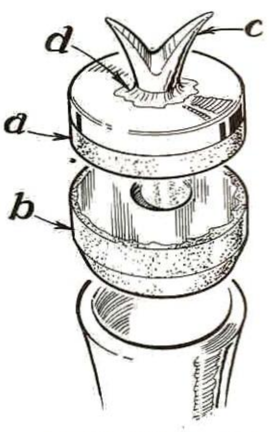


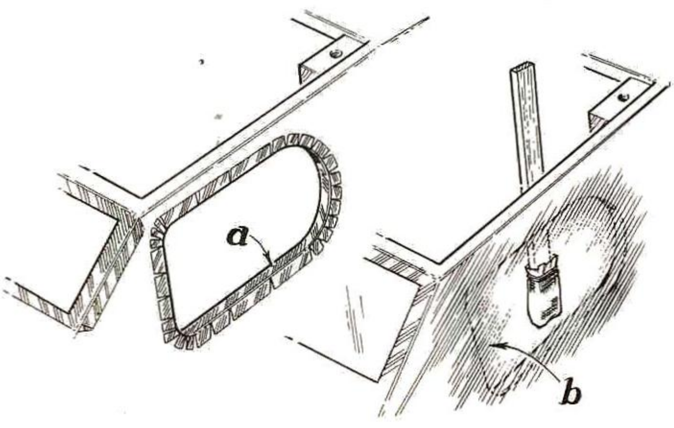
JOY OF SPRING

Where a muffler is retained with a wire clip as on the AME, cut the clip at the Xs, bend the ends into loops, then hook an Ace Hardware spring (no. 71) through the loops. It will be much easier to remove the muffler and less wear and tear on your fingers.

Charles Bovalis, Bloomingdale, IL







FLUSH WINDOWS

Seal the edges of window openings with a strip of covering film (a), then cover the fuselage as usual, including the window openings. After shrinking the covering, use a pad soaked in thinner to clean the colored adhesive off the inside of the film over the windows (b).

Butch Thigpen, Sneads, FL

PRIMING PLUG

These two rubber faucet washers (a) and (b) are glued together with PFM or Goo. The rivet (c) is spread to serve as a finger grip then epoxied solidly at (d). Reach through the cowl opening to jam the plug into the carb intake, then pull the prop over to suck in the prime. Do not forget to remove the plug before trying to start an engine. Attaching a red pennant to it is a good idea.

Daniel Kittle, Tempe, AZ

The Fairey Gannet

by GERRY YARRISH

On September 29, 1949, the Fairey Aviation Co. flew a prototype aircraft known simply as the Fairey 17. Designed to continue the development of Naval anti-submarine patrol aircraft, the Fairey 17 was the first aircraft ever to be powered by a double airscrew-turbine power system.

The powerplant of the Gannet was an Armstrong Siddeley Double Mamba, which basically consisted of two Mamba turboprop engines sitting side by side, each driving one of two coaxial, contra-rotating propellers. A unique feature of this setup was that for long-range patrols, the aircraft could cruise with one engine and prop turned off and feathered. The full power of both

Great Britain's 1950s turboprop sub hunter

engines was used only for takeoff and for military combat situations.

Unique features were its tricycle landing gear, three-cockpit design and its three-section folding wing panels. The outermost section folded down, while the inner section folded up, giving a "Z" shape to the completely folded wings. Armament consisted of torpedoes, bombs, depth charges or sono-buoys carried internally with rockets, and additional sono-buoys hung under the wing.

Top Gun Gannet

Dave Platt chose the Fairey Gannet AS-1 for his 1996 Top Gun entry. As with all of the models that Dave designs and builds, the Gannet is constructed of traditional balsa and plywood. The finish is K&B polyester resin and Dan Parsons 0.6-ounce fiberglass cloth. K&B epoxy paint is Dave's choice for color, and he custom-mixed the paint to perfectly match the full-size aircraft.

Custom-made items include a fully enclosed muffler system that guides the exhaust to the scale exhaust exits just aft of the wing and retractable landing gear that Dave based on his own Platt Competition Specials. Surface detail is very complete and includes everything from rivets and panel line detail to a beautifully detailed static spinner and props and a completely detailed tail hook. An enormous amount of effort went into the scale operating Fairey-Youngman flaps.

Dave earned a respectable 94.417 static points in his first of two years of competing with the Gannet at the West Palm Beach Top Gun Scale Invitational. It's uncertain whether we'll see Dave's Gannet again at the 1998 competition; the word is out that his newest project is a beautifully engineered North American T-28 Trojan. ✦

Dave Platt competed with his Fairey Gannet at both the 1996 and 1997 West Palm Beach Top Gun Scale Invitationals. As with all Dave's models, the $^1/_7$-scale model is built of balsa and plywood. The static display spinner and props are 100-percent scale and are a distinctive feature of the Fairey Gannet. Dave made the spinner from turned aluminum.

SPECIFICATIONS

Builder: Dave Platt, Palm Bay, FL

Model name: Fairey Gannet AS-1

Type: own design $^1/_7$-scale anti-submarine aircraft

Wingspan: 84 in.

Length: 70 in.

Weight: 19 lb., 15 oz.

Construction: traditional balsa and plywood

Finish: 0.6 oz. fiberglass cloth/K&B polyester resin/K&B paint

Radio used: Ace R/C MicroPro8000

Engine used: O.S. 1.08

Prop used: APC 15x8

Comments: Dave's model features many scratch-built parts including the muffler system, retractable shock-absorbing landing gear, scale functioning Fairey-Youngman flaps and scale spinner and tail hook.

Left: the functional and scale exhaust exits are just aft of the wing's TE. To route the exhaust gases from the glow engine, Dave used flexible metal tubes routed internally over the wing. Center: a closeup of the rudder and fin shows Dave's fine attention to detail. Note the taillight and the tail hook. Right: the functional Fairey-Youngman flaps required many hours of engineering and building to complete. Eight bellcranks are employed in the operation of the flaps.

MODEL AIRPLANE NEWS
FIELD & BENCH REVIEW

Balsa USA
Super Cub

A 1/3-scale PA-18 bush plane for land or lake

by CHARLIE VIOSCA

ONE OF THE most popular light aircraft ever built, the Piper Cub has evolved into many different versions, each with its own personality. From trainer and military observation platform to agricultural crop-duster and float-equipped bushplane, the Cub has worn many hats. Still seen at many rural airports, the Piper Super Cub—also known as the PA-18—with its enclosed engine cowl and flaps makes a wonderful scale R/C project. In 1/3 scale, the Super Cub is an IMAA-legal giant that's very hard to beat.

The Balsa USA* 1/3-scale Super Cub comes as a very complete kit. Everything you need to complete the model is in the kit; you supply covering material, engine, paint and glue. It comes with four sheets of plans as well as a detailing sheet and has an excellent, well-illustrated instruction manual. There are no tricks in building this kit, and anyone with some building experience can build this Super Cub. I used Balsa USA Gold CA throughout the model's construction.

To avoid any problems, read the instruction book before beginning, then follow the described building order without skipping around.

SPECIFICATIONS

Model: Piper Super Cub (kit no. 415)

Manufacturer: Balsa USA

Type: 1/3-scale monoplane

Wingspan: 141 in.

Length: 88¾ in.

Weight: 42.35 lb. (46.88 lb. with floats)

Wing area: approx. 3,000 sq. in.

Wing loading: 32.5 oz./sq. ft. (36 oz./sq. ft. with floats)

Airfoil: US35B

Radio req'd: 4 channels (rudder, aileron, throttle, elevator)

Engine req'd: 2ci to 4ci 2-stroke, 270cc to 320cc 4-stroke

Engine used: Brison 4.8 twin cylinder

List price: $597.95

Comments: the all-wood kit includes almost everything you need to complete the project; you supply the engine, radio, covering material, glue and paint. Included are engine cowl, aluminum-sheet material for covering, hinges, full-size plans, instruction manual, landing gear, instrument panel, inspection covers and rudder cables. Interior cabin detail parts as well as many die-cut balsa and plywood parts are included. This is a very complete and well-appointed kit.

Hits
- Excellent plans and instructions.
- Good quality of materials.
- Good value for price.
- Good flight characteristics.

Misses
- None.

PHOTOS BY CHARLIE VIOSCA & GARY CAMPBELL

FLIGHT PERFORMANCE

• Takeoff and landing

The Brison 4.8 fired up quickly using the Miller Persuader belt-drive starter. I taxied the Super Cub around to test ground handling and found it to be excellent. There was a brisk quartering wind from the left, and the model was not bothered in the least. I applied throttle, and the tail quickly came up. I expected the model to weathervane into the wind, but it tracked straight and needed very little right rudder. The model lifted off very smoothly with no tendency to leap off and climb steeply. After several passes to feel the model out, I made a no-flaps approach by reducing the throttle to about $1/3$ on the downwind leg. On final approach, I reduced the throttle to $1/4$ and when I had made the runway, I pulled the throttle to idle. The model floated a little and slowly settled into a nice wheel landing. Most flying is done with $1/2$ throttle.

• Low-speed performance

The model is very stable in slow flight, even without the flaps deployed. With flaps extended, it flies more slowly than you would expect for such a large model. I programmed my radio to add some down-elevator when the flaps are lowered. This counters any ballooning tendencies and works very well.

• High-speed performance

The Brison engine has all the power you need. As with any Cub, there is really no such thing as high speed. Full-throttle passes were made, and the Super Cub tracks well with a slightly tail-high up position. Sharp, steep pull-ups are easy, and the model climbs like a homesick angel. No sign of flutter was noted.

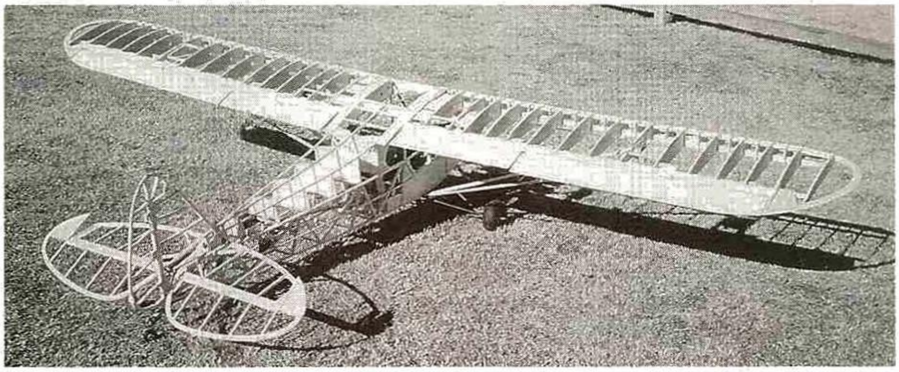
• Aerobatics

There isn't anything wild to do with a Super Cub. On the second flight, I made a loop and it was effortless, as was a slow roll. The slow roll is *slow*, and I increased the aileron travel about 1 inch from that recommended in the instructions. All other control throws were very good. I did another loop and held the Super Cub inverted for a short while to feel it out. Inverted flight is good and does not need excessive down of the elevators. The rudder and elevator are very responsive. I have reserved snaps and spins for future flights when I have a little more "feel" for the model.

The Balsa USA Super Cub is an excellent flying model, and I am enjoying it very much.

WING CONSTRUCTION

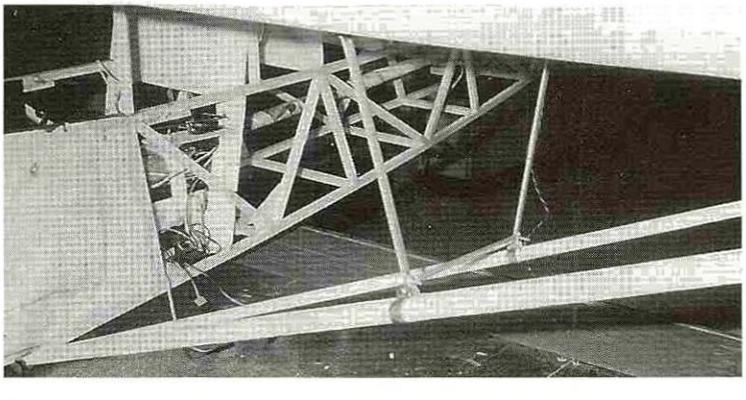
The wing panels are built over the plans. Construction is very straightforward with $1/8$-inch balsa and ply ribs, balsa and spruce spars and a solid balsa LE. The ailerons and flaps are also built up of balsa. The kit is for an older-style Super Cub having fabric-covered ailerons and flaps. The full-size aircraft I duplicated is a 1985 model and has metal-covered ailerons and flaps. I modified these areas on my model by using balsa sheeting painted with three coats of Aerospace Composite Products* Easy Lam epoxy to simulate the metal surfaces. I used Robart* HingePoints to hinge the control surfaces and installed Robart hinge pockets in the wing so I could later remove the ailerons and flaps. I also installed a McDaniel R/C* lighting system (see sidebar). This system has its own 6V battery and does not use the radio battery.



Here you can see the sheet-covered flaps and ailerons before the model has been covered. Also note the counterbalance tabs on the ends of the elevators.

TAIL CONSTRUCTION

The rudder, stab and elevators are built up using laminated balsa and lite-ply parts. Dowels and brass tubes are used in the center of the horizontal stabs and elevator halves so the parts can be removed. This makes for easier transportation and also gives the attachment points a very scale-like appearance. All the fittings, screws, tubes, wire struts and all the other necessary parts for the kit come in labeled plastic bags. The wire braces for the tail are made using Du-Bro 4-40 solder-attached and threaded fittings included in the kit. These braces are attached to the tail surfaces with small hex-head bolts and nuts—very realistic.



Here, the lift struts are attached to the wing and fuselage, and the jury struts are being installed. Assembly is very much like that of the full-size Super Cub.

FUSELAGE CONSTRUCTION

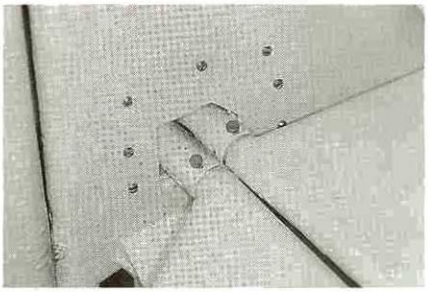
The fuselage is built up with standard construction methods using spruce stringers, cross-bracing and lite-ply formers. The two sides are built over the plans and then assembled over the top view. The formers, stringers and tail fin are then added, as are the balsa blocks that form the boot cowl.

Covering a model of this size takes a lot of cloth. I used Scale Stits covering from F&M Enterprises because it is the material used on the full-size aircraft.

The firewall is 3/8-inch ply, and the model is unique in that the cabin area is built and added after the fuselage sides have been constructed. Aluminum sheeting is included to detail the cowl boot area, and a bag of tiny screws is included to attach the aluminum to the model. A vacuum-formed plastic seat kit and cockpit parts are furnished as well as a beautiful fiberglass engine cowl. An instrument panel is also part of the package. I installed a complete IFR panel.

COVERING

I decided to cover the model with Scale Stits covering from F&M Enterprises*. This is the same covering, adhesive, paint and pinked rib stitching tape as is used on the full-size Super Cub, but it's manufactured in a lighter weight for use on models. I am very pleased with the finished results.



This shows the stab attachment tubes and scale attachment bolts and the metal cover plate attached to the vertical fin and the elevator—very scale.

LANDING GEAR

A complete, articulated landing gear is included in the kit. All the steel-tube parts are pre-cut, and you assemble the parts with silver solder and a propane torch. I enjoyed building the landing gear, and it is made easy with the included assembly jig.

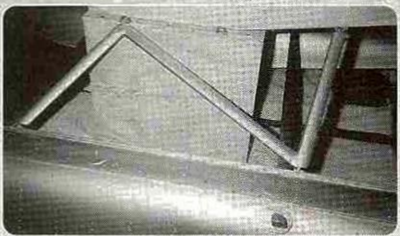
Balsa USA 1/3-SCALE EDO FLOATS

Hits
- Very fine kit.
- Good instructions.
- High-quality materials.

Misses
- None noted.

Balsa USA produce a superb set of floats to complement both the 1/3-scale J-3 Cub and the PA-18 Super Cub they offer. The completed floats weighed 7.23 pounds, including one Futaba S148 servo and all the struts and braces. These floats can be used on any model of similar size and weight. This is a very complete kit; glue and paint are the only items needed to complete the floats. My only addition was to finish the floats with fiberglass cloth.

The 15-page instruction book is very detailed and easy to follow. The floats are built up just like any balsa model. Construction starts by building up the backbone and adding formers to it. Be careful to get everything square. Plywood skins are then installed over the top and sides of the float. The bottoms are added last, after cross-braces have been glued into place.



The finished floats and attachment struts have been mated with the unpainted fuselage. Note the detail added to the floats.

I installed one Futaba S-148 servo in the left float directly behind the "step" bulkhead to control the water rudders. I built an access hole in the float, just in case I ever have to remove the servo. After the pushrod has been installed, you can add the bottom plywood sheeting. The servo lead comes out of the float at the aft N-strut attachment and runs up the strut to the fuselage, and a Y-harness connects the servo to the air rudder servo. The water rudders are easy to put together. I ordered one for each float and connected them with a threaded 4-40 pushrod installed in an aluminum streamlined tube. A ball joint and stainless-steel 2-56 bolts attach them to the arms. In case it becomes necessary to remove the water rudders, I permanently soldered two bolts to a plate on the inside of the transom and protruding outward. After painting, the rudders are placed on the bolts and secured with stainless-steel locknuts.

When the floats were complete, I trimmed and sanded the sheeting smooth and then glassed them with 3/4-ounce cloth and 60-minute EZ-LAM epoxy from Aerospace Composite Products.

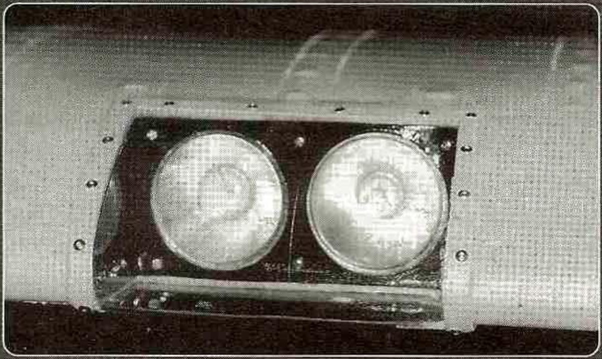
After finishing the floats I added the reinforcement angles to the chines, step and transom and added all the trim pieces around the cross-braces. After sanding, I primed everything with F&M Enterprises Superfill and then sanded again. This white primer is very easy to sand and a pleasure to use. Two coats of F&M satin-finish Poly Tone Nevada Silver paint finish the floats just like aluminum.

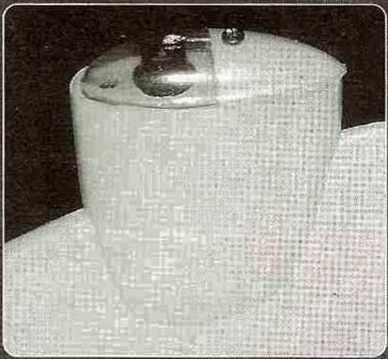
Taxiing with the one Futaba S-148 servo for steering proved ample. Flying the Super Cub with these floats was very easy. Adding power, it quickly comes on step and lifts off very smoothly.

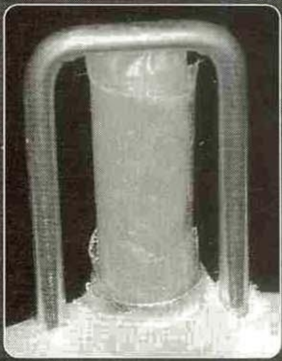
Charlie and his float-equipped Super Cub. The floats and model were made for one another.

McDANIEL R/C LIGHTING SYSTEM

Installed in the wingtips and rudder is the McDaniel R/C lighting system no. 180. This fine system is electronically controlled, and from the transmitter, you can turn on the navigation lights, the strobe mounted on top of the rudder and then the LE landing lights. They're turned off in reverse order. It is a very nice scale touch to be able to have navigation lights on in flight and then activate the strobe when entering the traffic pattern and, when you're ready to land, turn on the landing lights. With the system, you don't have to use all three lights at the same time. This system has its own 6V battery and does not use the radio battery.







Far left: the McDaniel lighting system may be turned on and off from the TX. Here you see the twin landing lamps under the clear LE lens. Left: the scale wingtip navigation light is a copy of the unit on the full-size Super Cub. Above: the strobe on the top of the rudder; the protective bar was added after I had broken the first strobe-light bulb.

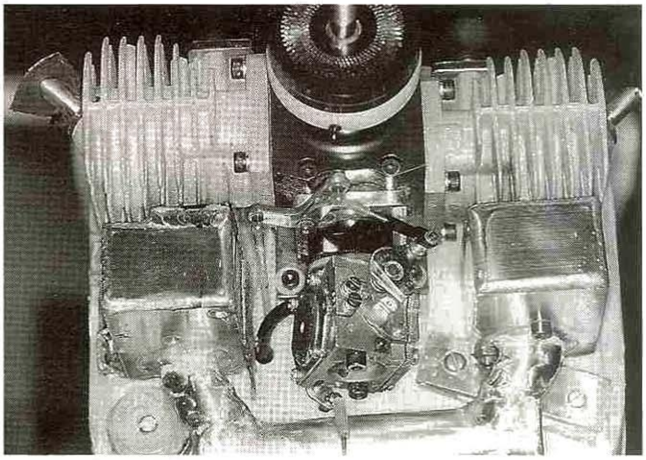
Bungee cords are used for shock absorbing, and the kit includes built-up bungee covers made of lite-ply formers and 1/64-inch ply sheeting. A C&B tailwheel is also included.

RADIO

I used a Futaba* 8UAF radio to control the model and used 11 servos. I also included working cockpit flight controls (stick, rudder pedals and throttle quadrants) actuated by four micro miniservos. I added a switch to the instrument panel located so that when I fly the model, I can turn these servos off and not unnecessarily drain battery power. A 6V, 1000mAh battery powers the receiver.

ENGINE

I chose a Brison* 4.8ci twin-cylinder engine equipped with a C&H electronic ignition system to power the Super Cub. I installed two adapters in place of the regular plugs so I could use smaller 1/4-32 engine plugs. I modified the engine cowl slightly because it was just too small to cover the plugs, and there was not enough exit air-space to cool the engine. The Brison is really powerful and runs exceptionally smooth. It turns up 7,500rpm spinning a 22x10 Zinger* prop. To start the engine, I use the Persuader—a belt reduction drive starter by Miller R/C Products*. This unit uses a Sullivan* DynaTron Super High Tork starter for power.



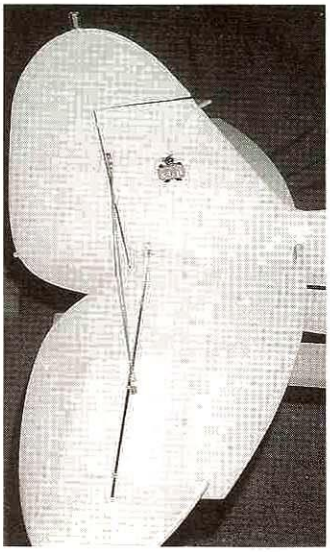
The Brison 4.8ci twin-cylinder gas engine is a tight fit, but there is no lack of power with this 141-inch-span model. Note the custom exhaust system.

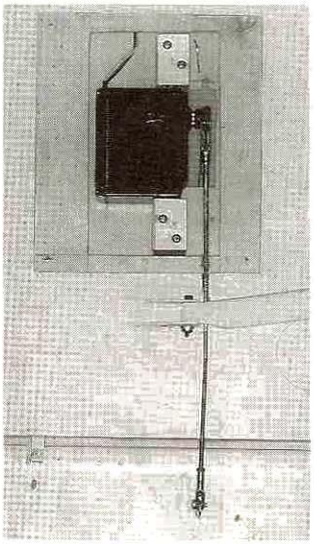
FLYING

The test flight went very well. I added power, the tail came up, and the model tracked straight down the runway and smoothly lifted off. The only trim needed was some down. Since this was the first flight, I did not attempt any aerobatics. Flying was smooth, and controls were very responsive. With the Futaba computer radio, I programmed the elevator to automatically give down-trim when the flaps were lowered. On final approach, the throttle was reduced to idle and a nice wheel landing was made. The model is very realistic in flight.

I'm sure you will be pleased with this Balsa USA model of the 1/3-scale Super Cub.

Addresses are listed alphabetically in the Index of Manufacturers on page 126.





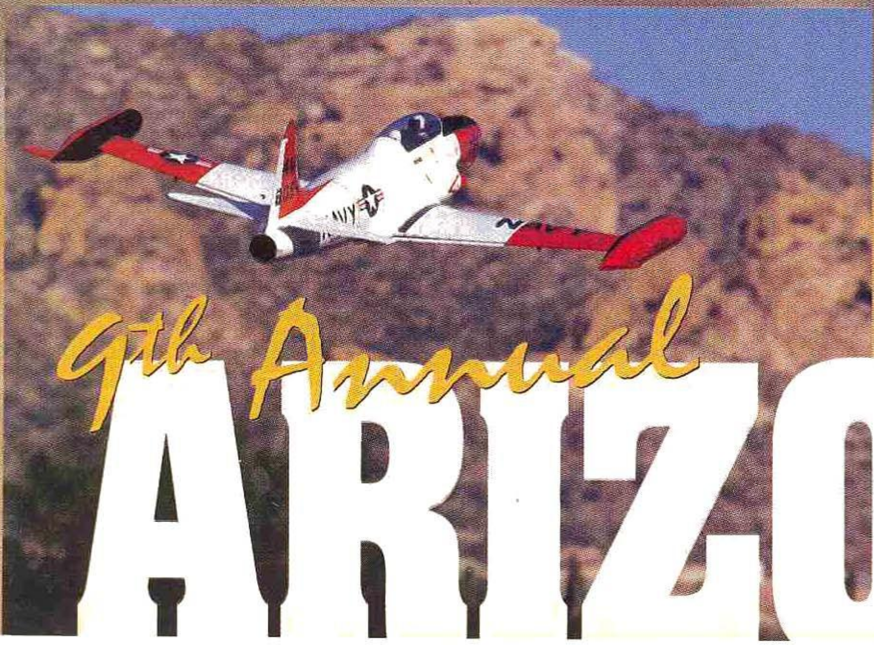
Right: the completed and covered tail feathers. Note the strobe atop the rudder. I added rib stitching and pinked-tape detail; you just can't do a Super Cub and leave this deal off. Far right: with the access hatch removed, you can view the aileron servo. Note the lift strut attachment method just aft of the servo.

Strafin' the Saguaros

9th Annual ARIZONA

by LARRY MARSHALL

I grew up in the Southwest—Phoenix, to be exact. Those who live there will be quick to tell you there's no better place on earth to live. This may be true, as rain is an event you simply wait out, rather than having to change your plans, snow is nonexistent, and air-conditioning is everywhere, so even the hot days of June aren't bothersome. For a modeler, it is heaven. There's more space than you'll find elsewhere, and good flying weather is virtually limitless. So I jumped at the chance to cover the Arizona Jet Rally. I didn't pay much attention to the local directions, as I had been to Spook Hill—home of the Arizona Model Aviators—before. The only problem was that this time, it wasn't there.

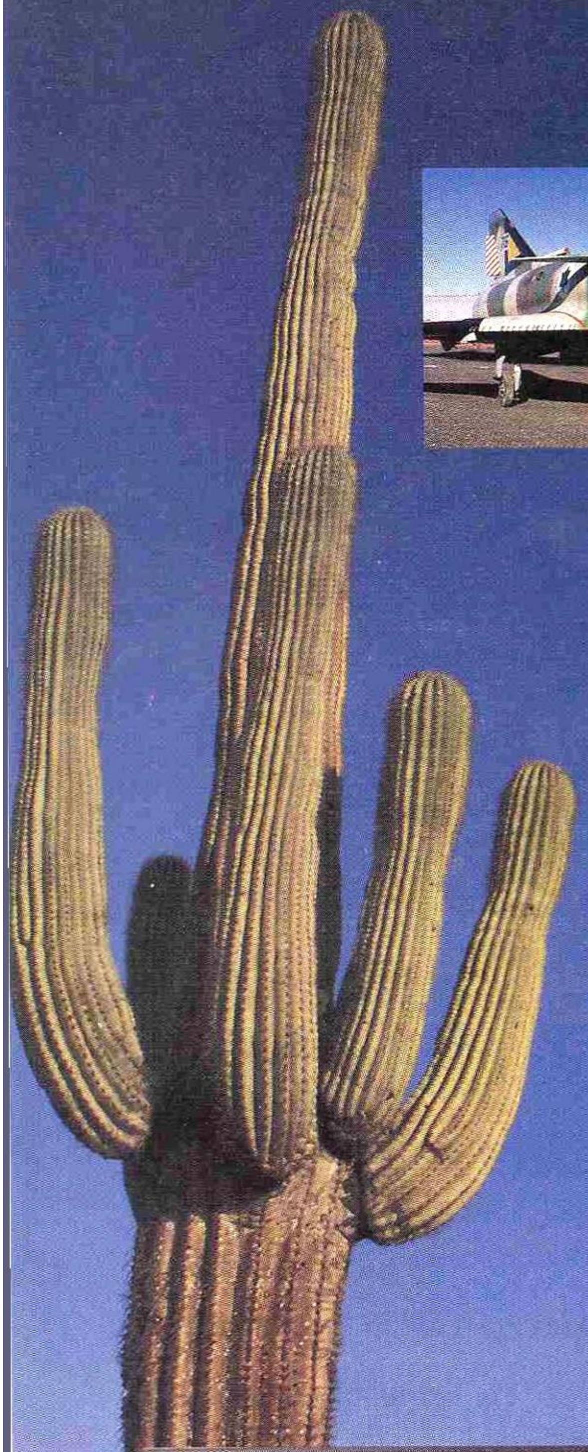


PHOTOS BY LARRY MARSHALL

Main image: Dan Avilla's BVM F-86 won the Best Boeing award. The Presto finish on this aircraft was superb. Inset far left: Mike Shoemaker's Jet Model Products T-33 takes off. Powered by an O.S. .91, it is impressive in flight. Inset left: International Orange never looked as good as it did on this T-33. Here we see it on approach.

JET RALLY

9th Annual
ARIZONA JET RALLY



Dorian Anderson's Kafir and Roy Mills' F-4 and A-4 were some of the jets in attendance from Jet Hangar Hobbies. For scale jets, these are relatively inexpensive and yet fly very well. Roy was using his A-4 as a testbed for his new Golden West turbine, which he plans to put in his current project, a JHH Panther.

EQUIPMENT LIST

TOTAL JETS: 84

Sport	27
Scale	57

KIT MANUFACTURER

BVM	18
Top Gun	12
Aeroloft	7
Scratch-built	6
Byron	5
Jet Hangar Hobbies	5
JMP	5
Yellow Aircraft	5
Relmond Modelworks	3
Air Champ	2
George Miller	2
Midwest	2
Parkinson Models	2
Paul's Flying Stuff	2
Robbe	2
Green Hangar	1
Jim Fox	1
Knights of the Air	1
Trim Aircraft	1
VR	1
Zone 5	1

TURBINES: 9

Golden West	3
Turbomin	2
Sophia	2
RAM Jet	1
JPX	1

ENGINES

O.S.	32
K&B	17
BVM	15
Electric	3
Rossi	2
Wankel	1
ASP	1

RADIOS

JR	28
Futaba	43
Airtronics	8
Hitec/RCD	3

Addresses are listed alphabetically in the Index of Manufacturers on page 126.

One of the more popular sport jets is the BVM Maverick. Stable in flight, it looks as if it's moving fast even when it's sitting on the flightline.

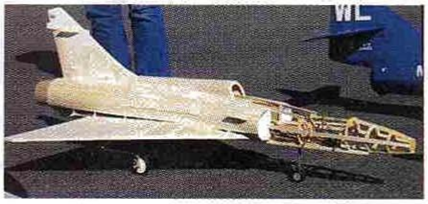
Jaime Cortez is prepping his Avonds (from Aeroloft Designs) Rafale for another flight.

Kevin Whitlow and Nat Lancaster showed us how Golden West turbines can power sport jets to spectacular performance. Much has been made of the scale sound of a turbine. I can tell you that it doesn't seem to get old; I love it.

Mike Kulczyk did a great job of scratch-building this Yak 15; he even scratch-built the retracts. He powers it with a BVM .91 and a Viojett fan.

Rei Gonzalez of R.A. Microjets was there with his new RAM 750 turbine—a kerosene-powered turbine just being brought to market. Rei was flying a BVM Bandit with it, and the 16 pounds of thrust provided great performance. One of the things that struck me while watching the guys power up both the Golden West and RAM turbines was the lack of a big, bulky flight box. The

Scratch-building jets from wood is not a lost art, as this partially completed Mirage indicates.



INEXPENSIVE JETS

Often, you hear that jets are just too expensive. While it's true that you can sink a lot of dollars into a large scale jet, there are alternatives if you want to get into jets without mortgaging the farm. There were a couple of examples of inexpensive options at the rally.

Aeroloft Designs is releasing what it calls the Value-jet. Two prototypes were flown at the meet. These are all-balsa, built-up aircraft with a projected street price of around $150. I got a chance to fly Steve Slachta's model; the darn thing can be throttled back such that it flies like a high-wing trainer, if you want it to. At speed, it's much more maneuverable, and with a big enough power system, should provide enough performance to satisfy all but the most jaded jet flyers, though high-G maneuvers may require a stiffer airframe. People interested in giving a ducted-fan system a try could benefit by using this plane to ease into flying jets and get used to operating ducted-fan equipment. Dedicated jet flyers might use this plane as an ideal power system testbed and/or engine break-in flight platform, as the entire system is exposed and easy to work on.

Another approach to inexpensive jets is the FJ-3 and F-86 from Paul's Flying Stuff. These are somewhat smaller than your typical jet, don't require fancy retracts, brakes and flaps and are powered by O.S. .25 and K&B .21s, respectively. Paul uses the RK20B fan to convert the power to thrust, thus, you can put one of these glass-fuselage beauties into the air for around $500. While I have no data, I think Paul had his FJ-3 in the air more than any other airplane at the meet, and it flew great.

FUNCTIONAL DROP TANKS

What will they think of next? Kevin Whitlow decided he needed more fuel capacity than his modified Top Gun Interceptor could carry internally. So he did what the full-scale guys do; he added a functional drop tank, nearly doubling his fuel load.

This idea works pretty well when flying a turbine (Kevin powers his Interceptor with a Golden West turbine), as they do not require a pressurized fuel system. The fuel system is set up such that the turbine draws from the drop tank first and then starts sipping from the internal supply. He holds the tank on the plane using a Dzus fastener that's operated by a servo so he can drop it at will.

9th Annual ARIZONA JET RALLY

Nat Lancaster had two JMP Starfires at the meet, one powered by a Golden West turbine and the other by an O.S. .91 and Dynamax fan.

required pit gear was no more complicated or bulky than that used to fly a .40-size trainer. There are a growing number of turbines showing up at these events, and as the prices drop, we'll probably see more.

A number of great models based on Jet Hangar Hobbies kits were in attendance. Roy Mills showed up with an F-4 and an A-4. Roy was using an A-4, one of his older models, to get used to the power characteristics of his new Golden West turbine. The F-4 was powered by an O.S. .91 and Dynamax fan.

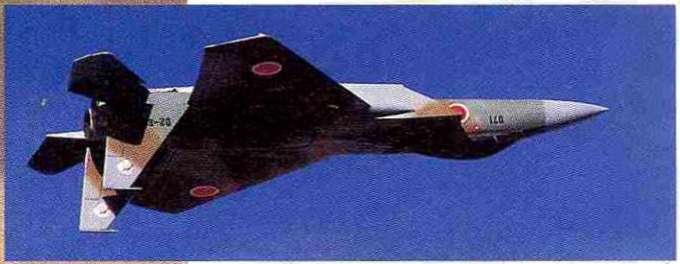
Chuck Stevens won the Best Scale award for his Air Champs F-15, powered by a Turbomin T-100. Chuck did a super job of flying it in a very scale fashion.

But I gotta tell you that my favorite was Dorian Anderson's Kafir, powered by a Golden West turbine. Unfortunately, Dorian had elevator problems that kept the plane grounded. Larry Wolfe (owner of Jet Hangar Hobbies) was there, being helpful to all who asked his advice.

Chuck Stevens earned the Best Scale Flight award, sponsored by Jet Hangar Hobbies, by piloting his Air Champs F-15 in a very scale, very precise manner. The model is powered by a Turbomin T-100 turbine, so he also had scale sound going for him.

A sign that aircraft-company mergers can even affect model competitions: Dan Avilla's F-86 won the Best Boeing Jet award (some of the Arizona Model Aviators work for Boeing). This is because North American, manufacturer of the F-86, was gobbled

Left: Rei Gonzalez and Al Araujo were flying a BVM Bandit with their new RAM 750 kerosene-burning turbine. Nice guys; nice product. Right: Kevin Whitlow brought his Jim Fox Models Grippen to the meet. He powers it with an O.S. .91 spinning a Ramtec fan.



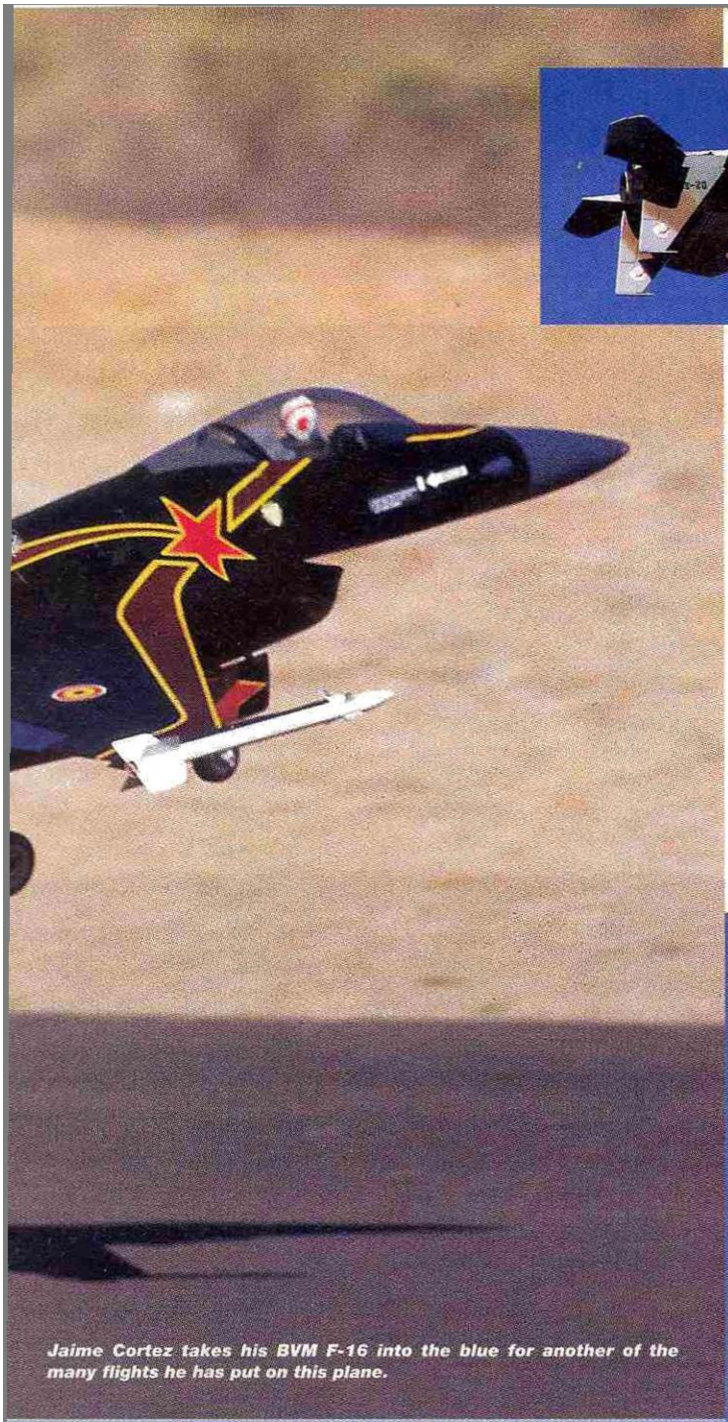
Paul Munninghoff gives his scale pilot a good look at the Arizona desert while making another low pass with his Top Gun F-15.

up by Rockwell International, which later became a division of Boeing, causing Dan's aircraft to become a legitimate contender for the award. Based on a Violett kit, it had a gorgeous metal finish that made it an eye-catcher on the flightline.

Nat Lancaster won the Best Graphics and Markings award, sponsored by Aeroloft Designs. Nat actually has two Jet Model Products Starfire IIs, both done in the bicentennial eagle paint scheme. One is powered by a Golden West turbine, while the other is powered by an O.S. .91 and a Dynamax fan. Nat flies them well, and they sure looked pretty in the desert sky.

It's hard to cover all the great flying, aircraft and pilots at this meet. The friendly nature of the jet community and their dedication to the hobby are consistent from place to place. But I highly recommend the Arizona Jet Rally as a place to go if you want to see why these guys like flying without propellers.

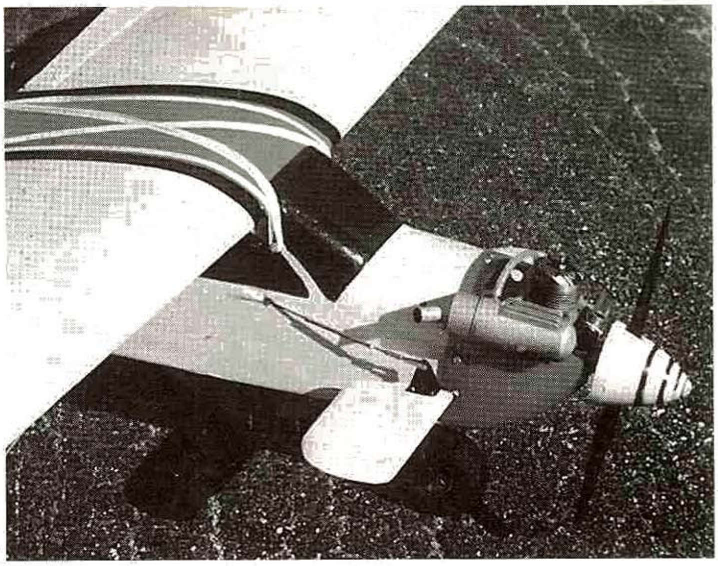
Bob Ruff, CD of the event, flew his Robbe BA-146 electric jet. Powered by four Speed 400 motors, it looked great in the air.



Jaime Cortez takes his BVM F-16 into the blue for another of the many flights he has put on this plane.

MODEL AIRPLANE NEWS
HOW TO

Add-On Canards



PHOTOS BY ROY L. CLOUGH JR.

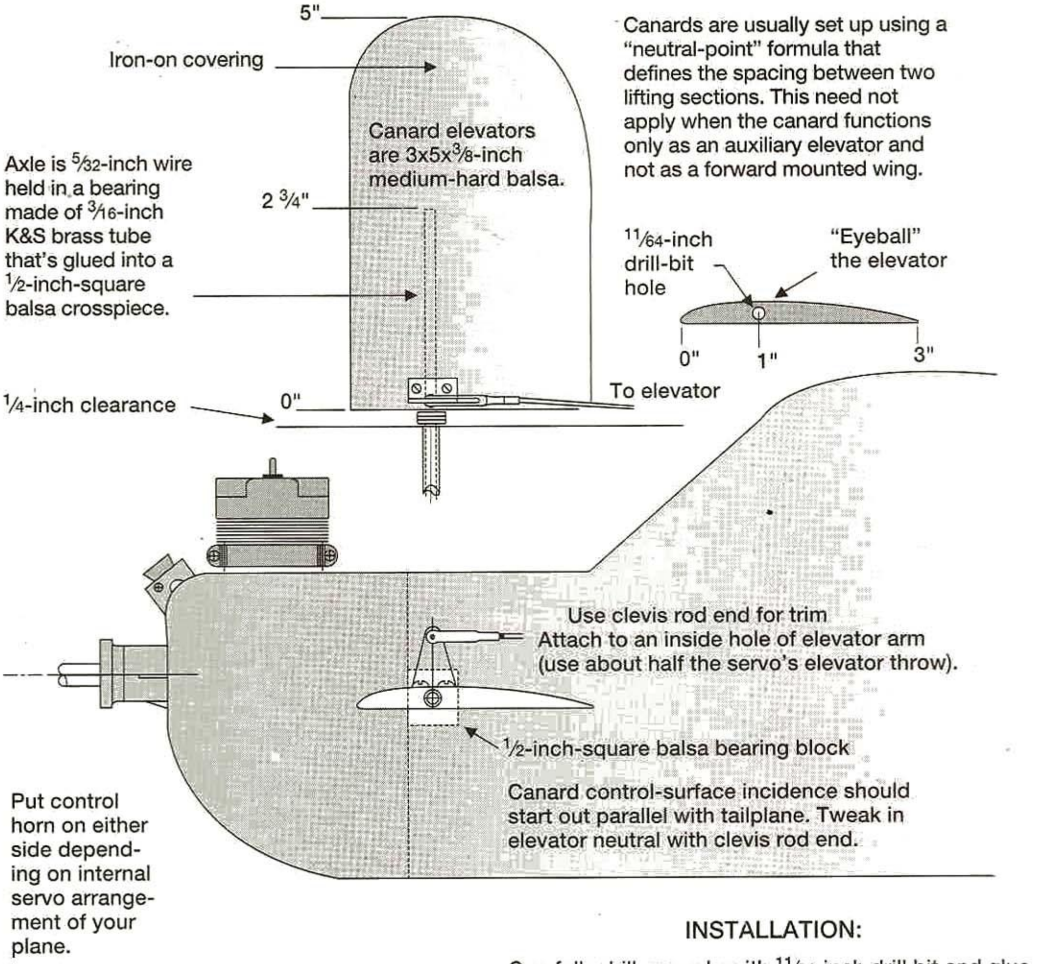
by ROY L. CLOUGH JR.

WHEN ONE OF my flying buddies decided to clean house, he offered me his elderly Sig Super Kadet at a price I couldn't refuse. The Kadet was a classic—worth hanging from anybody's rafters—and it was well built (too well built for my money!). At $7\frac{1}{2}$ pounds and with an ancient K&B .40 up front, its performance was most kindly described as "sedate." Naturally, I had to liven it up with more streamlined, somewhat extended wingtips and an increased aileron area. That took care of rolls, but inverted flight and outside loops the hard way (starting inverted at the bottom) escaped me. The plane was an ideal subject for the canard control surfaces I had always wanted to try. The photo shows the result of a surprisingly easy retrofit, and the drawing shows how it was done.

Functional Elevator Control

I feared the elevator stick would become tricky, but no problem: it was not so much more sensitive as it was more authoritative. Loops tightened up remarkably. Holding the wheels off longer, with the nose higher for a slower landing, was much easier. A real bonus: the canard's close proximity to the prop blast reduced torque effect and cut down on takeoff roll rudder diddling.

It hasn't happened too often in my design-bashing career that one of my brainstorms worked perfectly the first time (I admit to bleeding a bit for some of the innovations for which people tell me I'm notorious). But here, I've got a live one. I'm seriously considering adding canard elevators to one of my aerobatic planes. Go ahead; beat me to it! ✈



Be sure to hook up canards so they work contrary to the elevators, i.e., elevator trailing edge up equals canard trailing edge down.

INSTALLATION:

Carefully drill canards with $\frac{11}{64}$-inch drill bit and glue axle into one piece with slow-setting CA. When set up, use a couple of washers over the axle, and push it through the brass-tube bearing. Put a couple of washers on the protruding axle, squirt slow CA into the hole of remaining canard and slip the canard over the axle. Align canards before the CA dries.

MODEL AIRPLANE NEWS
FIELD & BENCH REVIEW

U.S. AIRCORE F-16

Fold up a JET!

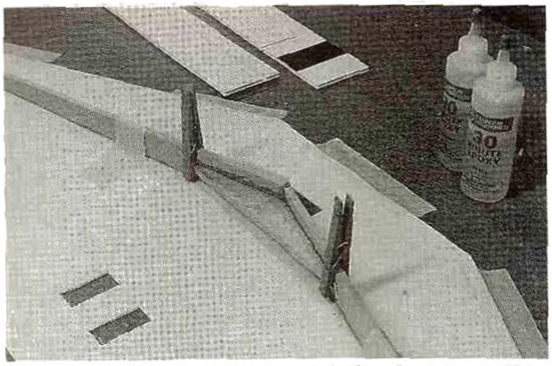
by JIM CASEY

IN HIS "SCOOP" COLUMN, Chris Chianelli called this F-16 "the coolest model to come from U.S. AirCore* so far." Who am I to argue with that? I had never built a U.S. AirCore model before, so I was unfamiliar with their unique construction. Still, I was curious, and I had flown some of the AirCore trainers. Despite these models' unconventional heritage, they do fly well, and they are rugged.

When I ripped into the box, I exposed what seemed to be acres of AirCore material (extruded polypropylene with cells between the surfaces). Most people remark that it reminds them of corrugated cardboard. The sheets are supplied in three thicknesses, as required for their intended purposes. Everything is attractively silk-screened with the graphics, so no decoration is required. All the parts are outlined with perforations—not quite die-cut. Many pieces can be punched out, but some must be trimmed out. The AirCore material is soft and easy to cut with a sharp hobby knife. I cut the straight lines along a metal straightedge, but I had to freehand the curves for the canopy and the wing saddle. Getting all the pieces punched and/or cut out took two hours.

There is no balsa in this plane. The plywood motor mount and the hardwood wing spar are the only wooden parts.

PHOTOS BY JIM CASEY

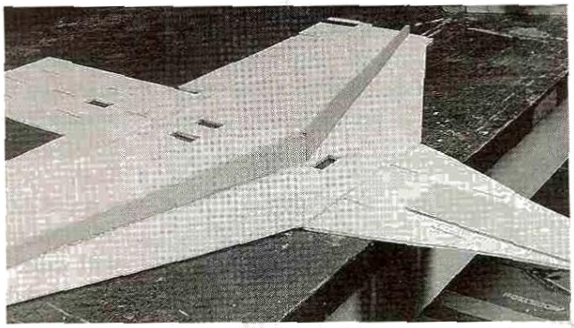


Assembling the spar on the wing. Note the wing uses no ribs.

TO THE BUILDING BOARD

My model-building experience was of little benefit here; AirCore's planes might as well come from an entirely different galaxy. They're not difficult to build, but all the rules/techniques/materials are different. The 18-page instruction manual has step-by-step instructions and sketches. There are no plans, and none are needed. I found only a few spots that needed more explanation.

AirCore describes the F-16 as "a high-performance, prop-driven sport airplane designed to give real jet-like flying characteristics." I was surprised that it has a flat-bottom airfoil, but I suppose a real F-16 doesn't spend that much time inverted. The wing is initially constructed flat on the board. Be aware that there is a top and a bottom to the tapered hardwood spar. The instructions tell you to sand the bevel at the center of the wing spar. Instead, I measured the angle at 31 degrees and snipped both spar ends off at 15.5 degrees on my band saw.



The wing in place on the fuselage crutch.

LET'S MAKE A WING

Wing construction seemed to me to be a bit out of sequence. The instructions say to epoxy the spar in place and glue the ailerons on, then lift the entire partial assembly onto the fuselage crutch before installing the top sheeting of the wing. There are no ribs, and I had a devil of a time keeping the wing straight with the tips unsupported while sheeting the top. I think it would have been much easier if I could have applied the top sheeting with the bottom skin flat on the table. Apparently, others have had the same difficulty, because the instructions go into some great detail about how to disassemble the wing and reassemble it straight. After the wing has been glued, you "finish" the leading edge with a strip of adhesive trim. The best you can hope for then is a 4mm-thick squared leading edge. A piece of square-edged molding is snapped onto the leading edges of the tail fins; this gives them a little impact protection, but I can't imagine anything good about the aerodynamic characteristics of square molding.

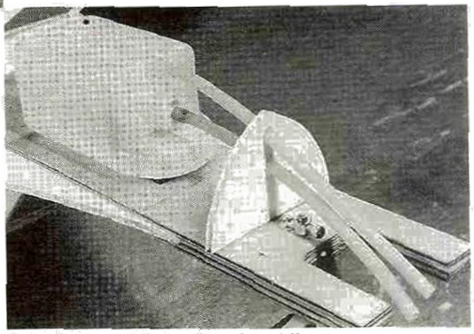
FINISHING UP

The wing, fuselage and stabilizer are all bonded to a crutch that guarantees perfect alignment. Line up the holes in the pieces, and when they match, press 'em down. This is an easy and effective method of ensuring alignment. There are two rows of slots in the crutch. The purpose for all the slots becomes apparent when you glue on the "duct"—the part that looks like the under-chin air scoop of a real F-16. The duct has tabs that fit into the slots in the crutch. When attached to the crutch, the duct forms a rectangular tube that gives the fuselage most of its strength.

The 5/32-inch landing-gear wire is embedded in two layers of AirCore material. To attach it, you drill 3/16-inch holes in the material and then thread 1/4-inch nylon bolts in. That's it—no nuts, no washers, no glue! I put two of the bolt heads over the wire (this is not explained in the instructions).

The instructions call for a Great Planes* 8-ounce fuel tank that I tried and tried to install. The tank just sits atop the ply crutch, much like the tank installation on a Swizzle Stick, but the problem was, there was no way I could stretch the fuselage top over the tank. The fuselage is triangular at that point, and the corners of the tank interfere with the sides of the fuse. After trying a few other tanks, I finally used a 4-ounce Du-Bro* flat tank. Even the flat tank interferes with the fuselage, but I was able to "persuade" it into place. Still, 4 ounces is not much fuel for a .46-powered airplane that the instructions say is "designed to be flown at 1/2 to full throttle most of the time."

The instructions recommend that you install the fuselage top with contact cement so that you can open it up if you need to get to the fuel tank. Contact cement is a superior adhesive for gluing a surface to a surface, such as mounting the wing in this airplane. The fuselage joint is a surface to an edge, and there's very little glue-joint area. I tried contact cement, but it would not hold with the pressure from the fuselage top trying to spring back. I had to remove the contact cement with solvent and then glue the forward part of the fuselage with a lot of CA and kicker to get it to bond. Even at that, it was necessary to insert a no. 4 sheet-metal screw through the corner into the ply motor mount to hold the part.



Installation of firewall and fuel lines.

SPECIFICATIONS

Model name: F-16

Manufacturer: U.S. AirCore

Type: semi-scale sport

Wingspan: 43 in.

Wing area: 414 sq. in.

Weight: 6 lb.

Wing loading: 33.4 oz./sq. ft.

Length: 53 in.

No. of channels req'd: 4

Radio used: Airtronics* Quasar

Engine recommended: .40 to .46 2-stroke

Engine used: O.S. .46LA

Prop used: Top Flite* 10x7 Power Point wood

List price: $149.99

Features: jet-like appearance without ducted-fan complexity.

Comments: the AirCore F-16 is a tame airplane for the flyer who wants impressive appearance without great demands on his building or flying skills.

Hits
- Pre-decorated, fuelproof construction.
- Straight linkages.
- Quick assembly; self-jigging construction.
- Looks jet-like in flight.

Misses
- Fuel-tank fit.
- Design of upper fuselage glue joint.
- Parts difficult to remove from sheet.

FLIGHT PERFORMANCE

With the 4-ounce tank, I knew I wouldn't have unlimited time in the air, although the ground runs of the O.S. .46LA provided over 7 minutes at full throttle. Consistent with O.S.'s reputation, the .46LA is a sweetheart of an engine. It started easily and had very linear throttle response. We never had a deadstick landing. Although the engine ran smoothly, very quietly and reliably, I could only get 60 or 70 feet of vertical.*

The instructions sternly warn, "If you lose power, the airplane comes down quickly," so I preflighted the airplane carefully. I let my son, Kevin, handle the sticks. He's a better flyer than I am, anyway.

• Takeoff and landing

The first unusual thing I noticed was that, on pavement, engine vibrations caused the nose gear to bounce the plane to the right. If I let the model sit and idle, it spun in circles. This got a lot of attention. As soon as Kevin gave it throttle, the F-16 answered to rudder, and a little down-elevator gave the nose wheel more steering authority. Takeoff was by the book: full throttle, into the wind, let it use all the runway to build up excess airspeed. Gently rotate. Build a little altitude, set a click or two of trim here and there. Wow! It looked pretty cool when it went by steeply banked, standing on a wingtip!

Landing is one maneuver this plane does really well. All the drag lets it slow down easily, so there's little danger of overshooting. Approach is made with the nose just a bit below horizontal and a little power on. Flare it above the runway, touch it down on the mains, and it really looks like an F-16 as it settles down. The only thing missing is the little puff of blue smoke off the tires as they touch down.

• Low-speed flight

Low-speed flight comes without any nasty tendencies. Chopping the engine to idle produces a respectable glide. In slow maneuvering, the aileron response gets a lot softer, but the big rudder remains effective. We only caught it dropping a wingtip once, and when we tried to get it to repeat that trick, it turned out to be only a wobble; I couldn't get it to snap out of full-up, low-speed, mushing flight.

Like the full-size F-16, the model's fuselage contributes to lift, so its wing loading is lower than it would seem. Also like the full-size F-16, the sharp, triangular leading-edge extensions alongside the nose cause a vortex over each wing at high angles of attack, contributing to maneuverability and delaying the stall.

• High-speed flight and aerobatics

Full-throttle flight offers no real challenges. The plane tracks nicely, and aileron response is adequate. A full roll takes about a second, as long as sufficient forward pressure is applied in the inverted part of the roll. I flew a few reasonably decent Cuban-8s and split-S's. Level inverted flight is comfortable with about ½ forward stick. Other outside maneuvers suffer with the flat-bottom airfoil. At the CG and control throws specified, power-on stalls came with no hint of a spin. There was no flutter in a terminal-speed dive. Stall turns worked nicely because of the big, high-deflection rudder. Other vertical maneuvers, such as loops and Immelmanns, suffered due to the limited vertical. This F-16 doesn't seem to go very fast or keep its momentum. It seems to have a lot of drag, with the big air scoop on the bottom and the fixed gear hanging out in the breeze.

RADIO INSTALLATION

The kit manufacturer supplies a lot of long music-wire pushrods, plastic clevises and Faslink snap-on keepers. Also, they provide a stranded flex-wire cable for the throttle linkage. I had to open the factory servo holes a little to accept my servos. The servo screws thread directly into the soft AirCore material, with no drilling required to start the screws. Servos are accessible via three hatches in the bottom of the duct. The manufacturer provides an extra pushrod wire that you run through a cell in the AirCore material to lock the hatches closed. Very clever! I found the servo arrangement unusual because the aileron servo is mounted in the rear. The rudder and elevator servos are mounted side by side in the center, and the throttle servo is mounted near the nose. There's a real temptation to use the rear servo to drive one of the rear control surfaces, but stick to the book, and the linkages will work out right. The pushrods run through guides provided to support them. Rudder and ailerons are activated via torque rods. To achieve balance, I had to relocate the battery from the position shown in the instructions. One cool trick: I found it is possible to route the antenna wire through the cells in the AirCore material along the length of the duct, then up through the tail fin.

The geometry of the aileron linkage gives differential throw. I could not achieve the specified 1$\frac{3}{16}$-inch throw on both sides of neutral, but with a flat-bottom airfoil, I speculated that it was acceptable to have some differential. I came up with 1$\frac{3}{16}$ inches up, ⅝ inch down.

Overall construction time was about 12 hours. The fold 'n' fly construction technique ensures good alignment, and the prefinished exterior saves a lot of covering time.

**Addresses are listed alphabetically in the Index of Manufacturers on page 126.*

O.S. .46LA

I decided to power the F-16 with the newest economy engine from O.S. Their LA-series engines are blue anodized and have remote needle valves mounted on plastic backplates, increased fin area for cool running, rib-reinforced crankcases and plain bearings.

The engine comes with fasteners, a glow plug and fuel tubing, and comprehensive instructions, including detailed flow charts that explain how to set the needle valve and the air bleed.

The engine has a ringless piston, and when I initially turned over the crank, I could feel the "pinch" at TDC that indicates the cylinder bore is tapered, exactly as one would expect in a higher-priced, quality ABC engine.

Aside from the remote needle valve, the carburetor is a classically familiar, O.S. air bleed unit. O.S. now supplies a short screw dedicated solely to holding the carb barrel. Great! Now the screw is tightened in place, and it won't vibrate out of adjustment. We can set the idle trim and shut down the engine from the transmitter. The small venturi guarantees good fuel draw, though possibly at the expense of maximum horsepower.

Since the crankshaft is the same between both LA engines (and, incidentally, the older .40FP), the increased displacement comes from a larger bore cylinder. With the same stroke, the mounting dimensions of the .46LA are the same as the .40LA's (and the .40FP's), and O.S. claims a 20-percent power increase with only a 15-percent increase in displacement and a 3-gram increase in weight.

The muffler is very effective. It is a traditional O.S. rotatable exhaust unit with a single conical baffle. Noise around the engine is not a problem. Unfortunately, I did not have access to a dB meter or a tach, so I cannot offer quantitative performance measurements. Power is adequate.

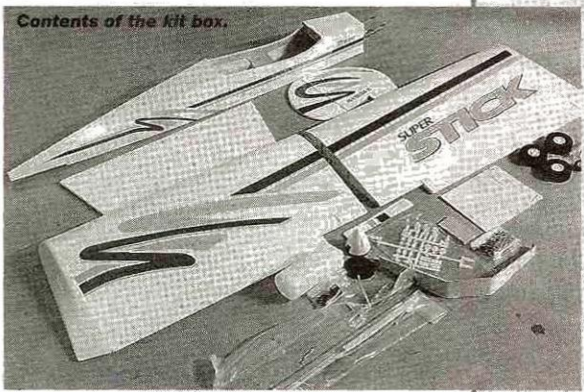
The O.S. .46LA is an intensely user-friendly engine. It starts easily and runs reliably, and the expanded cooling-fin area should make it somewhat tolerant to the odd lean run. I would not hesitate to recommend this as a trainer-sport engine where economy, convenience and reliability are more important than sheer, raw power.

ASSEMBLY

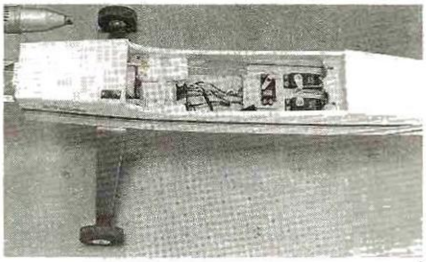
This is one of the best ARFs I have assembled. Fit, finish and quality of materials were at the upper range of what I have found with ARFs. Since it's an ARF, there are no plans. The 34-page instruction manual is a course in model building. It is illustrated with high-quality photographs, it is clear, and it breaks everything down into step-by-step operations. Nothing is left to the imagination.

Epoxy the wing halves together with two plywood splints that slip between the spars. Epoxy was not supplied, so I used Tower Hobbies* 30-minute adhesive and let it cure overnight. Dihedral of 3/4 inch (1.6 degrees) is built in.

The engine clamps into an aluminum engine mount; no jigging, drilling, tapping, swearing, or tantrums are required to get the engine appropriately aligned. It's easy to adjust the right thrust angle by loosening the clamp screws and moving the engine in



Contents of the kit box.



I placed the battery pack on the left to counteract the weight of the muffler. The receiver is in the center; a Styrofoam cushion is on the right. The switch is carried forward into the corner of the tank compartment to help with CG and for ease of access. The servo installation allows all pushrods to have straight runs.

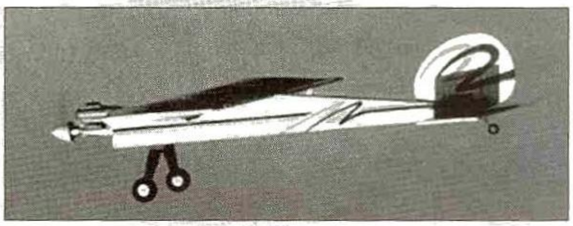
the desired direction. I set the engine for 2 degrees of right thrust. With the prop horizontal, measure from the leading-edge prop tip to the tail post. The left side should be about 11/32 inch longer with a 10-inch prop. A 4-stroke with a bigger, higher-pitch prop would use more right thrust.

Hangar 9 supplies a lite-ply servo tray that can be mounted in only one position. I had to open up the holes in the servo tray a little to accept my Hitec* 422 servos. This

FLIGHT PERFORMANCE

• *Takeoff and landing*

This is a no-brainer. The supplied aluminum gear has a wide stance and is just the right distance ahead of the balance point. Fire it up, aim it more or less into the wind, goose the throttle and hold a little backpressure on the stick. It's possible to drive the plane around some on the takeoff run. On pavement, it lifts off in about 50 feet. I was making takeoffs from pavement without touching the rudder stick. Takeoffs from grass were easy.



Because of the taildragger gear, I like to bring it in with the nose high and control descent with the throttle. I keep the nose high for a mushing approach, and the model slows nicely. Drooping the ailerons as flaperons causes a slight pitching-down effect and noticeably slows the landing speed. It's fun to shoot powered, nose-high landings and let the tailwheel touch first. The only tendency for the Stick to float shows when you arrive too fast and it has enough momentum to maintain altitude instead of settling onto the runway. It's not ground loopy or otherwise poorly behaved after touchdown. With the robust mounting block epoxied into the belly of this plane, I think the gear mount will be very durable. Side-slipping requires some deft work to hold the "forward" wing down, as the shoulder wing and its dihedral combine to give reasonably forceful yaw/roll coupling.

• *High-speed flight*

With the throttle set for "loud," the Stick tracks nicely. As square-edged and boxy as it is, the Super Stick still doesn't have a lot of frontal area, and it picks up speed well. It goes where it's pointed. Abrupt maneuvers are answered with eager response. The large control surfaces really work; they're not just advertising hype. Roll rate is at least two rolls per second. Loops can be big and round, and it helps to chop throttle in the descending parts of the maneuver to prevent excess speed from building up. With the dual aileron servos, there's no trace of flutter—even in terminal speed dives. There is, however, an odd whistling noise at speed that I suspect comes from the wind over the front wing-bolt holes.

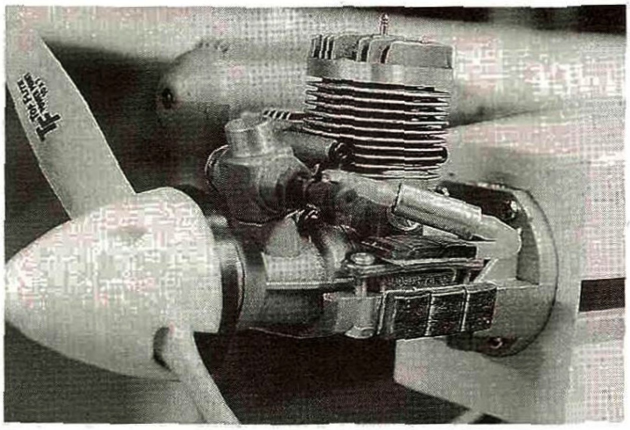
• *Slow-speed flight*

The Stick slows nicely. The big ailerons work all the way to the stall. Adverse yaw is not noticeable. Rudder can be disregarded most of the time; hardly anyone will notice. Stalls didn't happen from level flight with the CG and throws set per the book (high-rate). I found I could mush it around almost like a Lazy Bee at low speeds.

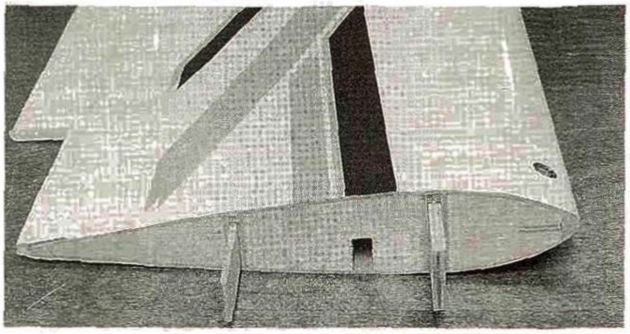
• *Aerobatics*

It's a Stick—not a pattern ship—but I'd love to see someone enter it in novice pattern. It will do almost everything, and it's an absolute ball to hot-dog with it. Inverted flight is easy and maintainable, requiring only a whisper of forward pressure on the aileron stick. Three consecutive rolls will not be too challenging for Joe Sunday Flyer. Rolling circles are not out of the question, either. With the Thunder Tiger .40, the Stick will hover for 3 or 4 seconds before falling off. Try to hover, chop the throttle, and the Stick does a nice tail slide. I tried a Graupner 10x6 prop and got noticeably better vertical performance at the expense of some top speed. We could hear the motor rev higher, too. The Super Stick maintains momentum well if you don't horse it around too violently. It's also fun to fly a full set of aerobatics at 1/2 throttle. Flying knife-edge is a lot of work; you have to compensate with both aileron and elevator to keep it straight. The Thunder Tiger .40 is powerful, responsive and reliable, but the plane will tolerate more power. With more power, aerobatic performance would improve.

Snaps and spins are *right now*, with about 1/2 turn of overshoot after neutralizing the controls. Avalanches work nicely because the snap comes just at the mushiest part of the maneuver. I can't get a flat spin with the CG and control throws as specified by the manufacturer. Hammerheads are easy: point the Stick up until it stops and then slam the rudder.



One and a half ounces of tape weights were applied to the engine mounts.



The wing joiner splines are trial-fitted.

was a simple job with a hobby knife. I'm glad I had to stretch the servo holes a little rather than "shrink" them.

The tank holds 320cc (almost 11 ounces) of fuel. This is enough fuel to fly with any .40 to .46 2-stroke.

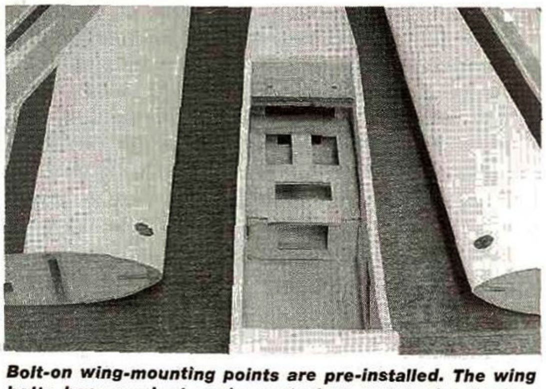
The tail fins are solid balsa. The control surfaces are pre-hinged with plastic flexible hinges, but it's up to the builder to epoxy the hinges into place. Before I attached the elevator, I clamped the wing into place and carefully leveled the elevator to be parallel to the wing. The manufacturer did a good job preparing the fuselage saddles, and the horizontal stabilizer saddle required only a little sanding before it lined up with the wing. Don't hinge the tail parts at the same time as you hinge the wing. Follow the sequence detailed in the instructions, or you might find it difficult to use the tailwheel.

Linkages, landing-gear installation, etc., are all fairly straightforward. The supplied wheels are light foam that shows some wear after a few sessions of flying off pavement. If you fly off grass, the wheels will probably last for years. The kit comes with drilled and slotted wooden pushrods with instructions for attaching plastic clevises to the control-surface end and Z-bends to the servo end. The supplied control horns are plastic, and the installation instructions are explicit. I like to use a piece of sharpened 1/16-inch music wire, twisted by hand, to drill through the control surfaces for the servo-horn screws.

With the servos, linkages and all major components in place, I installed the receiver, battery and switch. I tried to slide these components around and get the model to balance as specified, but I still had to add 1½ ounces of lead to the nose. The nose-gear weighs approximately the same as the lead in the nose. Those of you who wish to build this with trike gear instead of tail-dragger gear may be able to avoid using lead at all.

CONCLUSION

The hardware and components of this kit are better than average. None of the components was defective or inadequate. If I had built this kit for my own purposes instead of as a review model, I would have used an 8-ounce tank and all-metal clevises on carbon-fiber pushrods, because I avoid using Z-bends whenever possible. Those are, however, only my preferences and are subject to debate.



Bolt-on wing-mounting points are pre-installed. The wing bolts bear against a plywood plate inside the leading edge. Four bolts are used to hold the wing. A small ring of fuel tubing on the bolts prevents them from being lost while the wing is off the plane.

SPECIFICATIONS

Model name: Super Stick .40

Manufacturer: Hangar 9

Type: sport ARF

Wingspan: 52¼ in.

Wing area: 593 sq. in.

Weight: 5.5 lb.

Wing loading: 21.3 oz./sq. ft.

Length: 40 in.

Engine req'd: .40 to .46 2-stroke, or .50 to .65 4-stroke

Engine used: Thunder Tiger Pro .40 ABC

Prop used: Top Flite 10x7 (wood)

Number of channels req'd: 4 (5 or 6 optional, if ailevator/flaperon mixing is used)

Airfoil: symmetrical

Washout: no

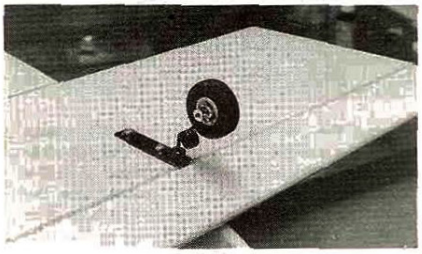
List price: $169.95

Features: balsa ribs, hardwood spars, D-tube wing construction; lite-ply and balsa fuselage; complete hardware package with tail-dragger and tricycle landing gear; printed "ARF-cote" plastic covering.

Comments: I wasn't afraid to try anything with this airplane. This is a delightful, general-use sport model, and if you own only one model, this would be an excellent choice. It's a very well-executed ARF.

Hits
- Can be built as a tail-dragger or trike.
- There's an aileron servo in each wing.
- The security of a bolt-on wing.
- Simple and enjoyable to build and fly.

Misses
- None.



The simple, rugged tailwheel is supported by a steel plate. Hinge the elevator and rudder after installation.

From the time I opened the box on my freshly cleaned workbench to when I carried the plane out the back door to taxi around the yard, 10 work hours had elapsed. I have a reputation for building quickly, but the Super Stick went together well with no surprises.

**Addresses are listed alphabetically in the Index of Manufacturers on page 126.*

The Nicholas Beazley NB4

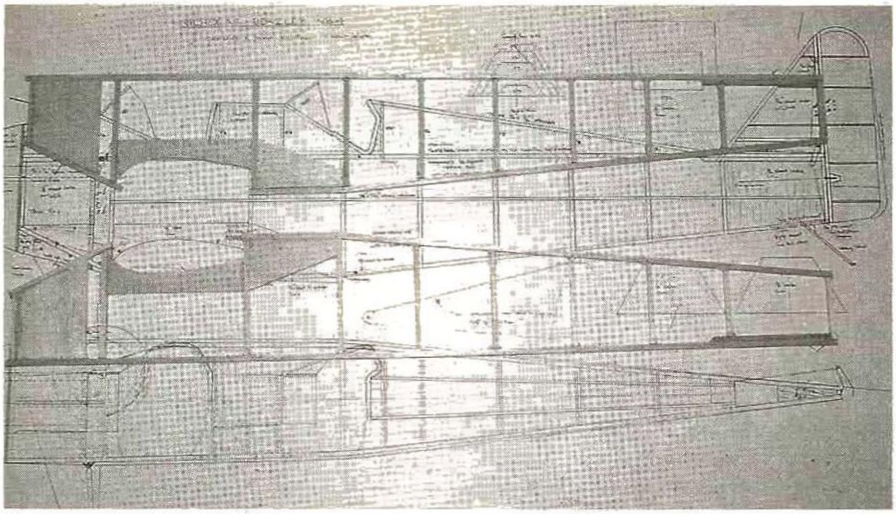
by PHILLIP KENT

ONE OF THE fascinating aspects of designing and building scale model aircraft is being able to choose a subject from the almost limitless number of full-scale prototypes that have been built over the years. Whether the model is of a well-known aircraft or one that's more obscure is up to the builder. Searching through aviation literature for that little-known aircraft can be most rewarding.

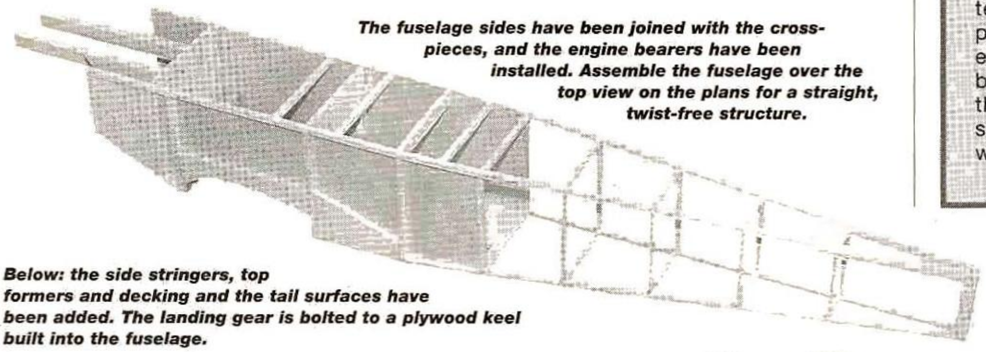
An unusual 3-place monoplane from the 1920s

One such aircraft was the Nicholas Beazley NB4, a 3-seat monoplane from the late 1920s. The Nicholas Beazley Aircraft Co. Inc. was founded in 1921 and supplied various approved aircraft materials and accessories to the public. In only a few years, the firm became one of the largest suppliers of aviation equipment in the United States and was known as the place to get just about anything from a split pin to a ready-to-fly aircraft. The aircraft that were originally sold by the company were war surplus "Standard" biplanes.

PHOTOS BY PHILLIP KENT

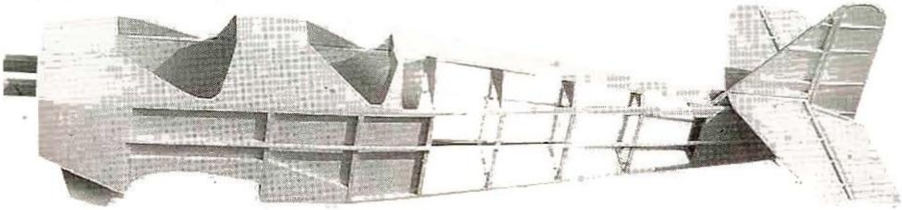


Begin construction by building the two fuselage sides. Pin the longerons in place and follow with the sheet-balsa parts.



The fuselage sides have been joined with the cross-pieces, and the engine bearers have been installed. Assemble the fuselage over the top view on the plans for a straight, twist-free structure.

Below: the side stringers, top formers and decking and the tail surfaces have been added. The landing gear is bolted to a plywood keel built into the fuselage.



In 1929, the firm marketed the 3-place Barling NB3. It was powered by a 5-cylinder LeBlond engine and eventually was developed into the Nicholas Beazley NB4.

THE MODEL

I drew up my plans using Robert Hirsh general arrangement drawings as a guide. The model is 1/5 scale and has a wingspan of 76 inches. The first model built from my plans was constructed by my good friend Joe Bentley, and he did a fine job. The model weighed in at 9 pounds, and the O.S.* .48 Surpass 4-stroke engine originally fitted to it proved not to be powerful enough. I replaced the engine with a Laser .75, and this proved to be more than adequate.

Though simple in overall design, the NB4 can be spruced up with some fine detail work in and around the cockpit area, and some dummy Wright Whirlwind engine cylinders from Williams Bros.* will add much to the nose. I used Williams Bros. 5-inch diameter Golden Age wheels on the prototype model.

SPECIFICATIONS

Name: Nicholas Beazley NB4

Type: 1/5-scale monoplane

Wingspan: 76 in.

Length: 53 in.

Weight: 9 lb.

Wing area: 912 sq. in.

Wing loading: 22.8 oz./sq. ft.

Airfoil: flat-bottom

Radio req'd.: 4 channels (throttle, elevator, rudder, aileron)

Engine req'd: .46 to .60 2-stroke, .56 to .75 4-stroke

Engine used: Laser .75

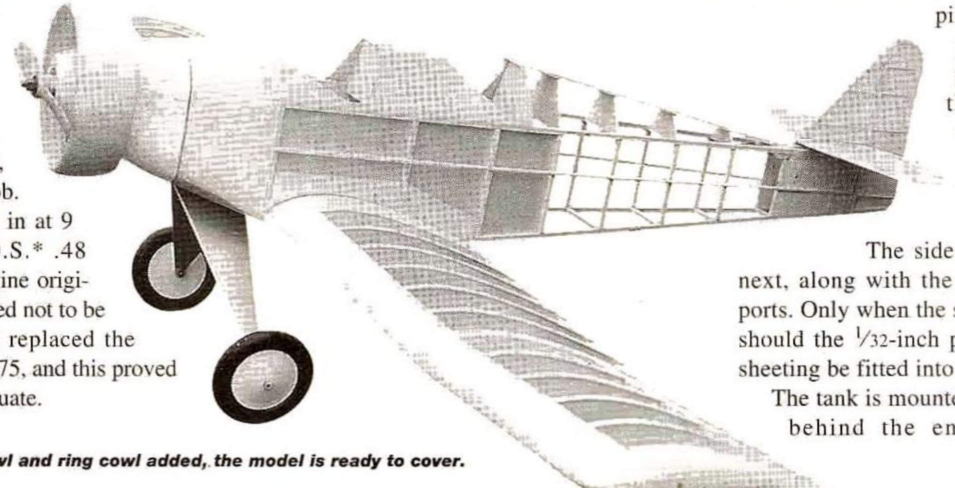
Features: the Nicholas Beazley NB4 is a traditionally built, all-wood monoplane. The wing has a flat center section, and the outer panels provide the dihedral. The tail feathers are built around a core sheet of balsa, with ribs and edges added at the top and bottom before being sanded to shape. The tail must be wire-braced for strength.

With its very simple lines, the NB4 is very easy to build, and a modeler who has a few projects under his belt should encounter no problems. The model uses standard built-up model aircraft construction techniques, and a spruce box is used for the basic fuselage structure. The "box" is filled out with top decking and side stringers to give it its final form. Start construction by building the fuselage side directly over the side view. Pin the top and bottom longerons in place, followed by the uprights and sheet-balsa parts. I always build the second fuselage side directly over the first after I've covered the first side with clear plastic to prevent the sides from sticking together. To get an accurate, twist-free fuselage, I suggest building the basic box over the top view. Cut the cross-members to size first, then pin the sides over the plans. When the parts are dry, add the formers and the engine bearers followed by the top-decking formers.

The side stringers are added next, along with the triangle balsa supports. Only when the stringers are in place should the 1/32-inch ply cockpit-covering sheeting be fitted into place.

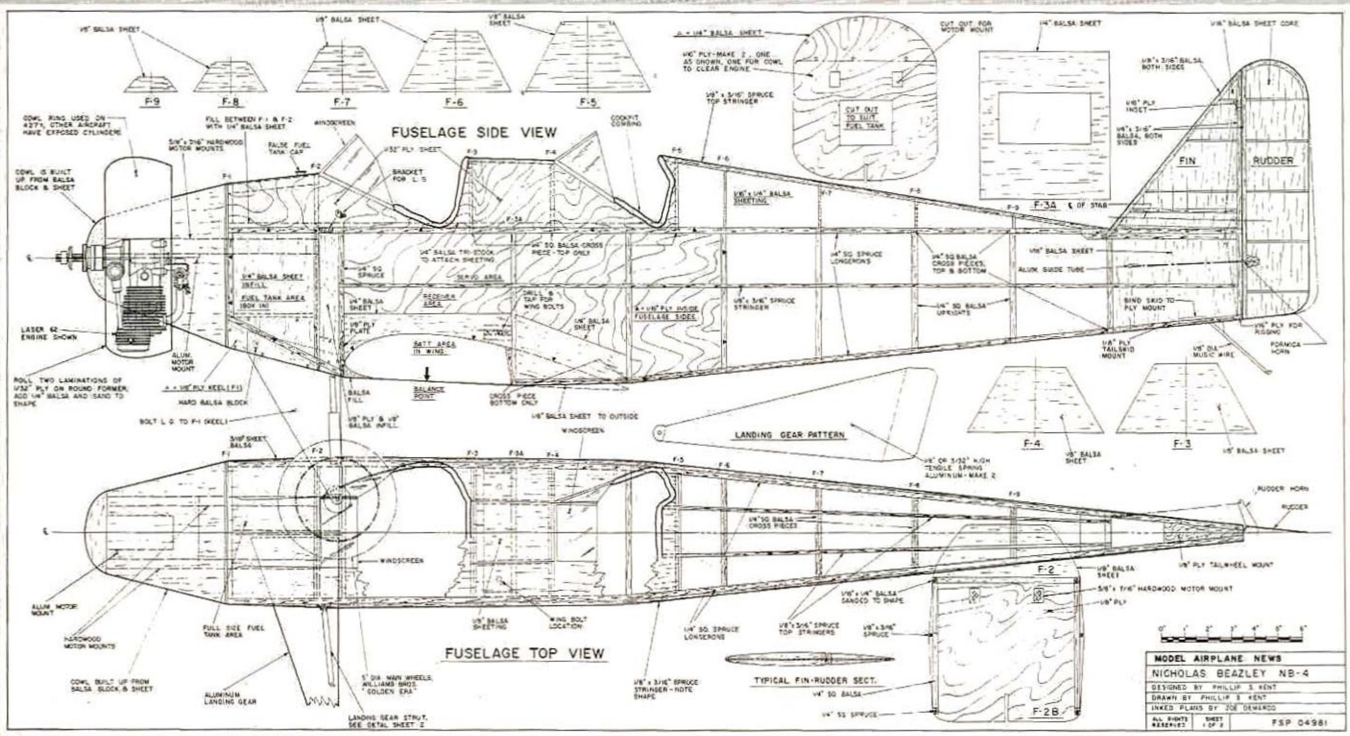
The tank is mounted in a fuelproof box behind the engine and can be

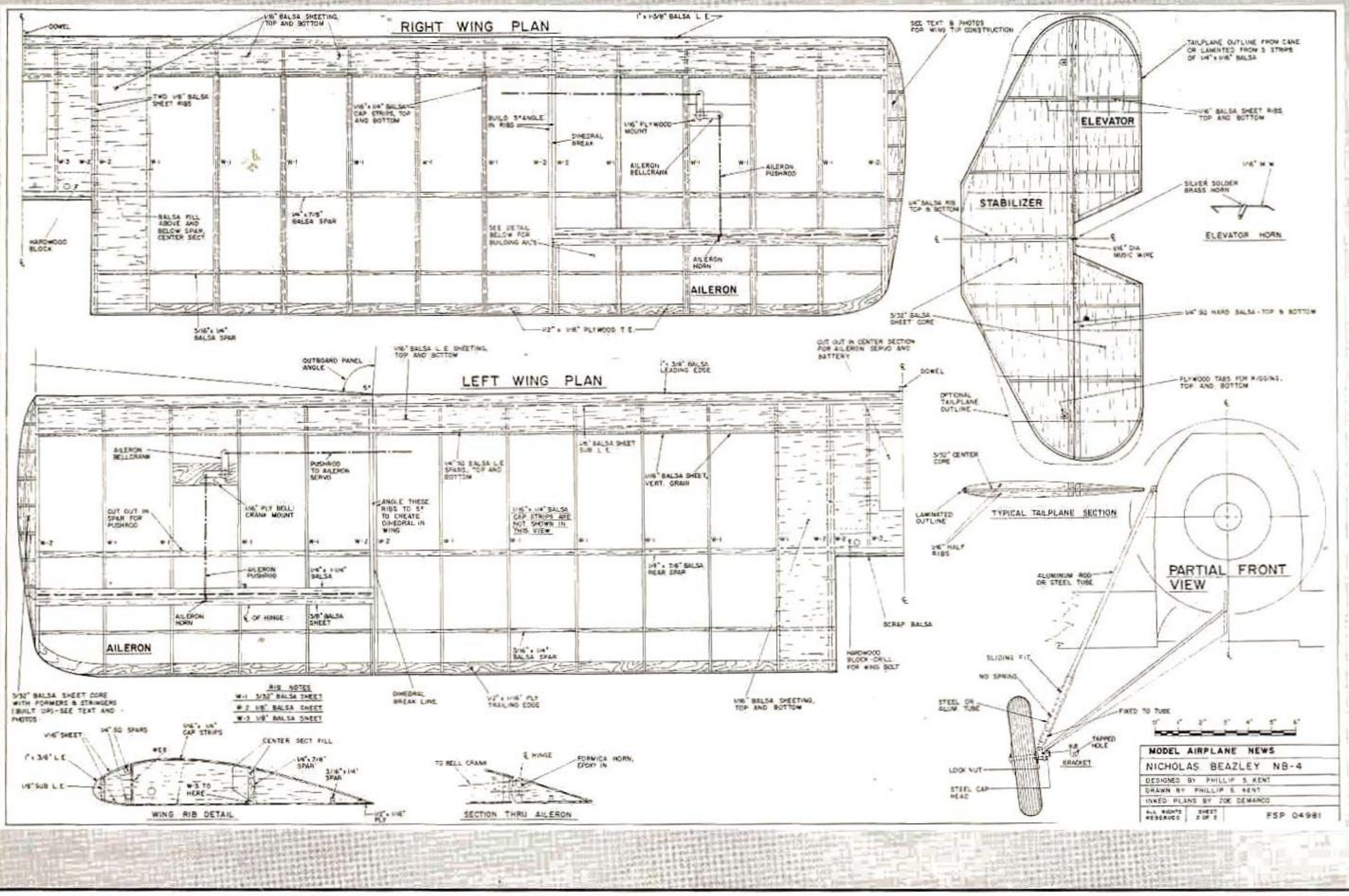
(Continued on page 60)



With wing, engine cowl and ring cowl added, the model is ready to cover.

To order the full-size plans (FSP06981), see page 111.





FLIGHT PERFORMANCE

• Takeoff and landing

The original model was outfitted with an O.S. .48 4-stroke engine and was very much underpowered. The first test flight ended with a stall shortly after takeoff. Refitted with the Laser .75, the model cruises easily off the runway with very little need for trim changes. Landings are just as easy and require just a bit of power to be held in until flare.

• General flight performance

The Nicholas Beazley is an unusual-looking model, and in the beginning, the smallish tail surfaces concerned me a bit. It has, however, proven to be an easy model to fly. The model is stable and capable of mild aerobatics, although I am sure the full-size aircraft did not perform in this manner. For a scale model flown in a scale fashion, the Nicholas Beazley is undemanding. In fact, the model handles windy conditions surprisingly well.

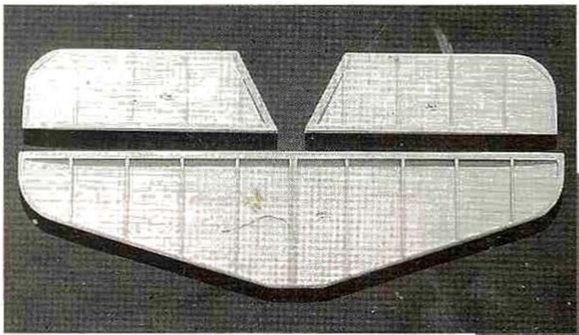
• Aerobatics

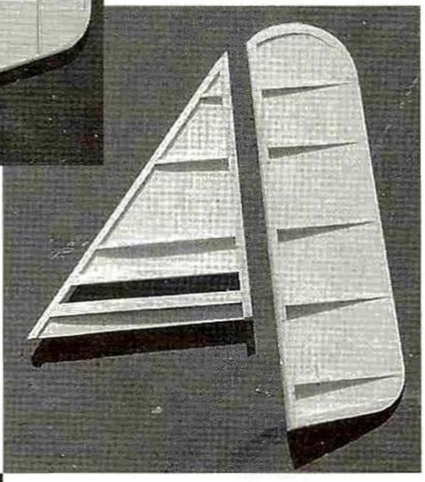
Not designed for aerobatics, the Nicholas Beazley has demonstrated its aerobatic ability. On one occasion, the throttle became stuck and the model could not be landed. In an effort to make the engine stop, the model was repeatedly looped, rolled, stall turned and flown inverted, all to no avail. When the engine did eventually die, it was dead-sticked in with no problems. The model is at its best making slow, sedate flybys at a low throttle setting.

(Continued from page 57)

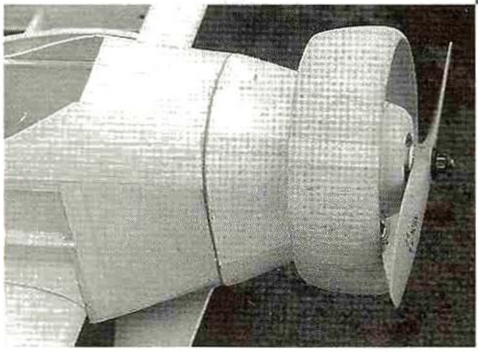
accessed from the front through a square opening that has been cut into the firewall. The full-size aircraft was flown from the rear cockpit with up to two passengers sitting side by side in the front. I added much detail to the rear cockpit for a pleasing scale look, but since documentation was sparse, I had to use much guesswork in the cockpit's appointments and around the engine area. The nose is covered with litho plate, and this gives a most authentic finish to the model. Since the radial engine is very much a part of the looks of this model, I highly recommend that you install it. As mentioned earlier, I used the ⅙-scale Williams Bros. kit. The cowl ring shown on the plans and in one of the construction photos should also be included if you are going to match up to scale drawings. I built mine from two laminations of 1/32-inch plywood with a facing of 1/4-inch balsa sanded to shape. Balsa is used to shape the engine cowl, and the model engine is mounted to the engine bearers with a mount plate. This arrangement came in very handy when I switched from the original engine to the Laser.

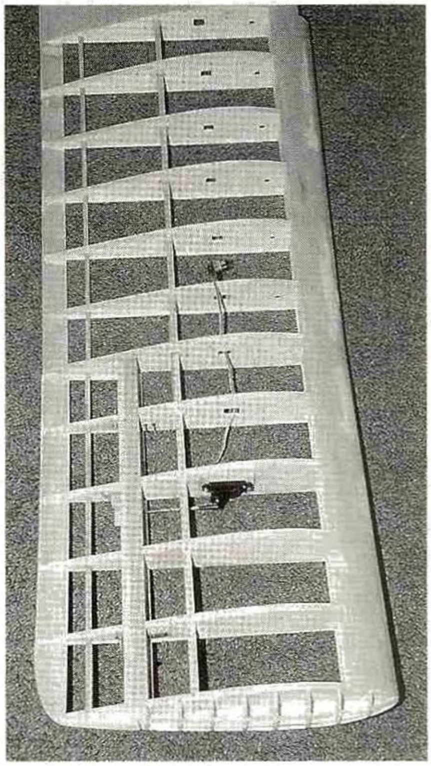
The tail surfaces are built around sheet-balsa cores to which LEs, TEs and ribs are added, top and bottom. Once the glued parts have dried, the entire surface is sanded to a symmetrical airfoil cross-section. It is important to set the tail surfaces at the correct incidence, as shown on the side view. Rigging wires are required for adequate strength, as the support area is rather small. For control, a pushrod actuates the elevator while a closed-loop pull/pull system controls the rudder. I have also included alternate outline shapes on the plans for the rudder and



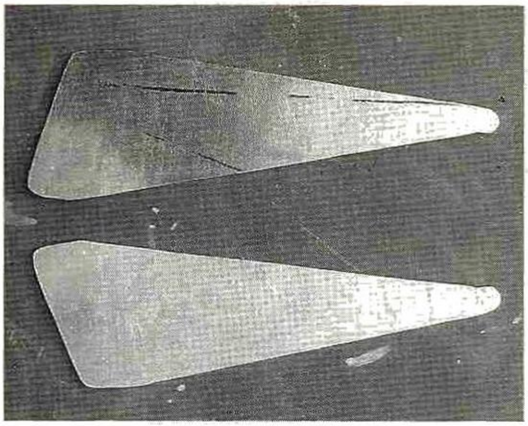


Above: the horizontal stab and elevator halves are built around a core sheet of balsa, with ribs and edges added top and bottom. Construction is quick, strong and lightweight. Right: the fin and rudder are constructed in the same way as the horizontal stab and elevator. Here, the left side sheeting of the fin has been left off to show the internal structure. Below: the ring cowl used on some Nicholas Beazley models is a nice touch. The inside of the ring is made with a lamination of 1/32-inch plywood sheeting, and then 1/4-inch sheet balsa is added to the outside to give it shape.





Wing construction is typical for a scale, built-up model. D-tube construction adds strength, as does the thin plywood TE. Note the built-up wingtip structure that duplicates the full-size wingtip structure.



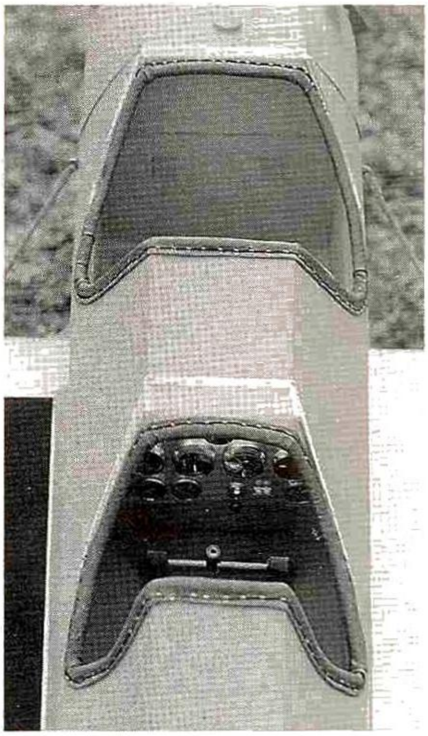
The landing gear is made simply from sheet Duraluminum. The material is bent to shape and then bolted to a plywood keel piece in the bottom of the fuselage.

the horizontal stab and elevator. These are shown in the construction photos and match the scale, general-arrangement drawings.

The landing gear is unusual but not at all difficult to build. An 1/8-inch ply keel plate (F-1) is built into the fuselage between the firewall and the LE of the wing. Flat Duraluminum landing legs are bolted to the keel. The gear is made from either 1/8- or 3/32-inch high-tensile-strength spring aluminum, and a pattern is shown on the plans. A steel axle is attached to the aluminum gear, and brackets connect the axles to the side Oleo struts. The struts are not sprung and consist simply of telescopic fitting brass tubes. Another bracket arrangement attaches the top of the strut to the fuselage.

THE WING

The wing consists of a flat center section with outer panels providing the dihedral. The wing uses D-tube construction with a main spar and sub spar at the rear. An 1/8-inch balsa sub LE is used to support the LE sheeting, and the 1/4-inch LE is glued to the sub LE after the LE sheeting has been sanded flush with the sub LE. Plywood is used for the TE, while balsa capstrips are used on the ribs. The ailerons are the full length of the outer panels and have a generous area for good roll control. Note that the ailerons should be hinged as I show on the plans. The hinge centerline is placed back within the aileron. To do this, I used Robart* HingePoints inserted into long, aluminum-tube extensions. (Details are on the plans.) Differential aileron control is achieved by placing the aileron control horn as shown. The wingtips are built up rather than carved from solid-balsa blocks. As this was a noticeable feature on the full-size aircraft, you should use the built-up technique as shown.



The rear cockpit is already appointed with fine detail, but the front is bare at this point. Little documentation can be found as to the original equipment, so use your imagination.

COVERING AND FINISHING

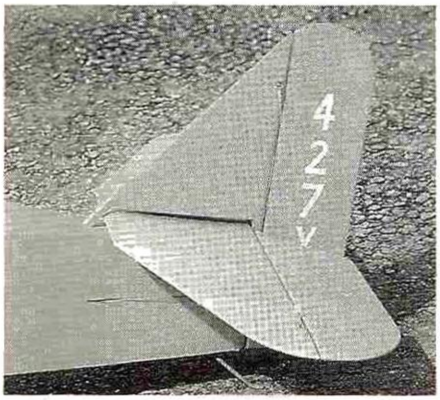
The finish on the prototype model is heat-shrink fabric. The wing and horizontal tail surfaces were painted in silver, while red was used on the fuselage, fin and rudder. The finish was done in polyurethane. All the lettering and numbers were hand-painted with matte-finish enamel. The finishing touch is a coat of eggshell fuelproofer to seal everything.

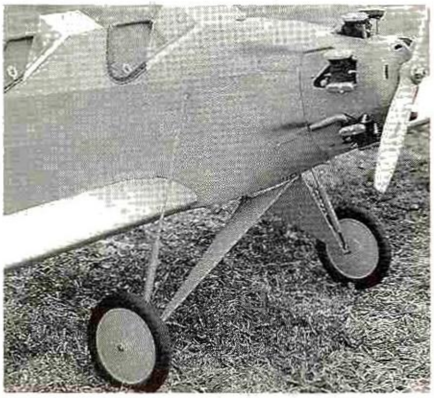
Fine detailing includes leather cockpit-edge padding, pilot and passenger seats, instruments and flying harness. Rib-stitching tape on the prototype was duplicated with masking tape, but strips of heat-shrink fabric would work just as well. Small blobs of white glue applied with a toothpick simulate the underlying rib stitching.

The radio gear is fitted in the cockpit area, while two servos are fitted in the wing panels for aileron control. I am sure that with careful selection of materials, the Nicholas Beazley could be built at least a pound lighter than the prototype model; this would enable a .60-size 4-stroke engine to be used to power it, or perhaps it could even be flown electric-powered. Many scale enthusiasts enjoy the challenge of building an unusual or rare aircraft. The Nicholas Beazley certainly falls into this category; it is not the prettiest aircraft around, but it does have character.

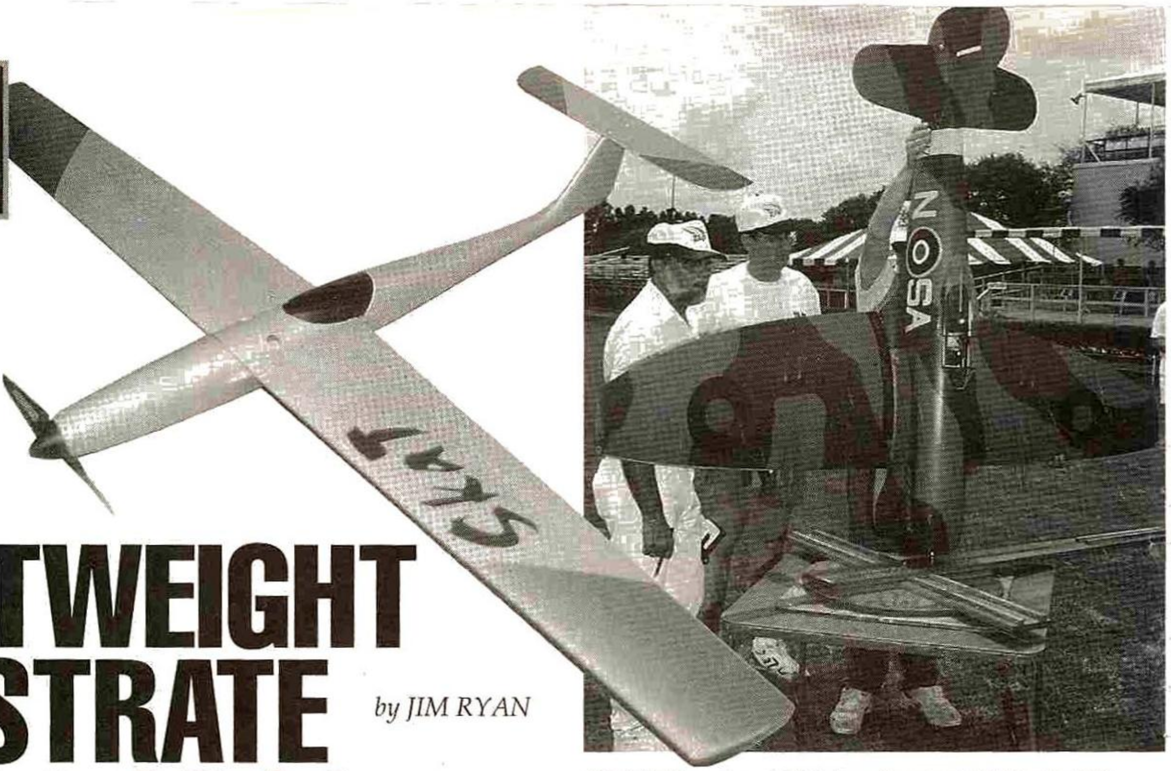
**Addresses are listed alphabetically in the Index of Manufacturers on page 126.*

Right: the landing-gear arrangement is unusual but not very difficult to build. The Oleo strut is not sprung; it consists of telescopic brass tubes attached to the gear and fuselage with simple brackets. Below left: for adequate strength, the tail must be braced with wires. Below right: with cockpit edge padding, litho-plate sheets attached around the engine area, and the Williams Bros. cylinder heads and wheels attached, the illusion is complete. A very good first scale project for anyone who already has a few models under his belt.





MODEL AIRPLANE NEWS
HOW TO



LIGHTWEIGHT SUBSTRATE for painted finishes

by JIM RYAN

What do these two models have in common? They're both covered with silkspan—one of the best-kept secrets in modeling.

OVER THE LAST 25 years, the choices of covering materials for R/C models have expanded steadily. So why is it that some old-timers still cover models with old-fashioned silkspan? Well, I'm not exactly an old-timer, but I can think of four reasons. Covering with silkspan is easy, cheap, fun and beautiful! Silkspan is lightweight, accepts nearly all paints readily and will never ever sag, bubble, or wrinkle. It goes on just as easily over sheeted structures and open framework, and repairs are a snap.

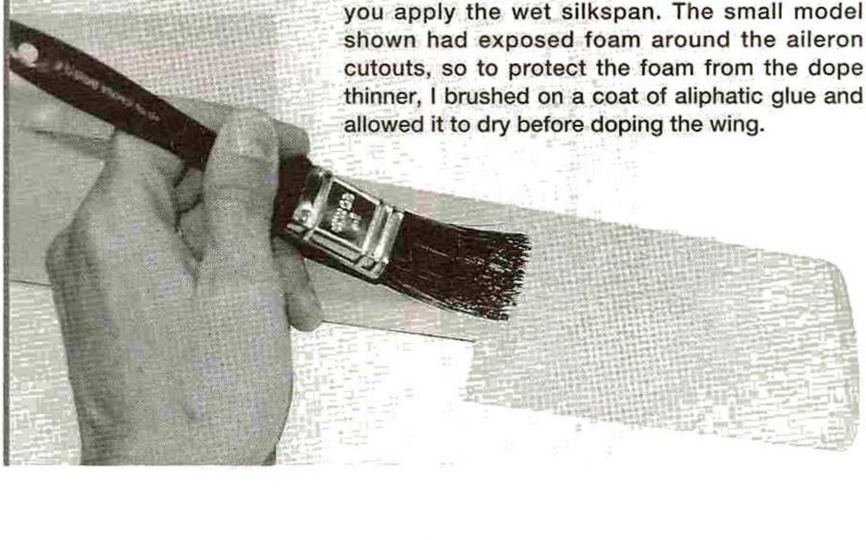
While it's generally used on smaller models like old-timers, ½A glow and small electrics, silkspan is also an excellent surface prep for sheeted surfaces—even on giant-scale warbirds. It's an excellent choice for applications such as simulating fabric-covered control surfaces. Be forewarned, though: silkspan is easier to tear or puncture than most modern coverings, but it's also extremely light.

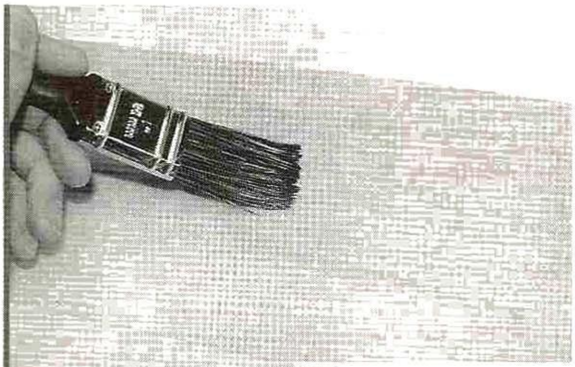
Please note that the nitrate dope used for applying the silkspan is not fuelproof. If the model is going to be exposed to fuel, you'll have to use a fuelproof paint, such as butyrate dope, epoxy, or polyurethane, over the nitrate. For electrics or gliders, you can use whatever you like for the color coats. Another nice technique is to color the silkspan with household dye before applying it. The options are almost endless.

1 The required materials include: sheets of silkspan (for all but the smallest models, I use medium or heavy material), nitrate (not butyrate) dope, dope thinner, water, two or three brushes, talcum powder and 240- and 400-grit wet/dry sandpaper.

PHOTOS BY JIM RYAN

2 After finish-sanding the airframe and removing all dust, brush two to three coats of 20-percent thinned nitrate dope on all surfaces that will contact the covering. Sand the airframe lightly with 240 sandpaper between coats. You'll want a reasonably waterproof seal so the balsa will resist warping when you apply the wet silkspan. The small model shown had exposed foam around the aileron cutouts, so to protect the foam from the dope thinner, I brushed on a coat of aliphatic glue and allowed it to dry before doping the wing.

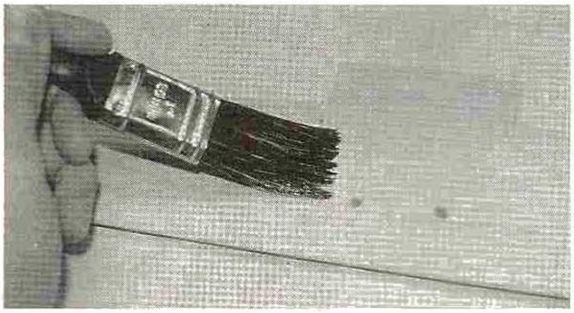




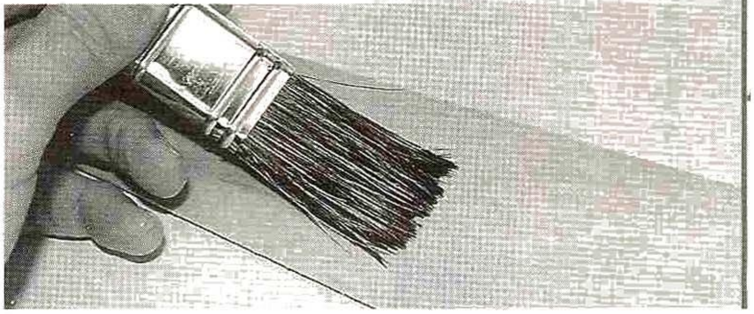
3 I recommend starting with the bottom of the wing, as it's the easiest surface to cover. Lay the wing on a clean work surface and trim a sheet of silkspan to size so that there are 1 to 2 inches of excess around the perimeter. Brush the sheet of silkspan with water until it's completely saturated. This will cause it to swell and wrinkle.

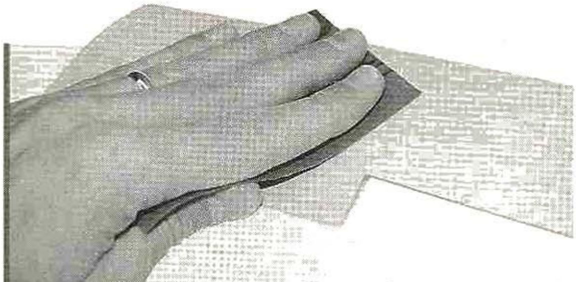
4 Start lifting and smoothing the silkspan until all the wrinkles have been removed, and it's pulled fairly taut. The wet brush will help you to force bubbles to the edges. Be careful not to tear it, although even wet, it's surprisingly tough. Wet a piece of 240 wet/dry sandpaper and, sanding on the downstroke *only*, feather away the excess silkspan. You'll find you can easily work around compound curves and can wrap the material around the leading edge and wingtip.

5 Once the silkspan has been trimmed, and *while it's still damp,* brush on a coat of nitrate dope that has been thinned 50 percent. The dope is highly thinned because you want the thinner in the brushed-on dope to partially dissolve the dope that's already on the bare balsa. This will bond the covering to the airframe. At this stage, it will look mottled, whitish and ugly, but all will be well once it has dried.



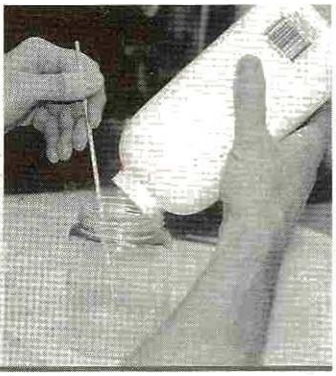
6 Continue to cover the rest of the wing and then the fuselage following steps 2 through 5, overlapping the successive pieces so there are no gaps. If you tear a sheet or can't get it to lay properly, just lift if off and try again with a fresh sheet. Apply a second coat of thinned dope to the covered airframe to make sure the silkspan is fully saturated.





7 Once the entire airframe has been covered and doped into place, allow it to dry thoroughly. As it dries, the silkspan will turn a uniform white color and will pull nice and taut. Next, brush on two to three additional coats of dope, sanding *very* lightly between coats with 400 or finer sandpaper. Be careful not to sand through the silkspan, especially over open frame.

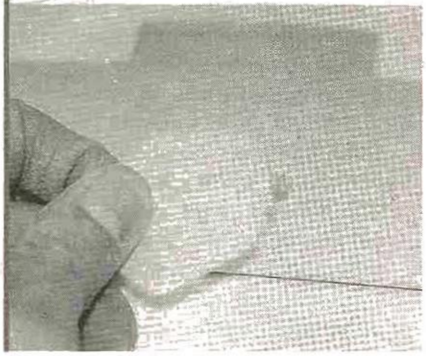
8 To fill the weave before painting, mix regular talcum powder into your thinned dope until you have a slurry. You'll have to acquire a feel for how much to use; too little, and it doesn't fill very well and is harder to sand; too much, and the filler will be porous and won't take a smooth paint surface. The right mixture is the consistency of watery wallpaper paste.

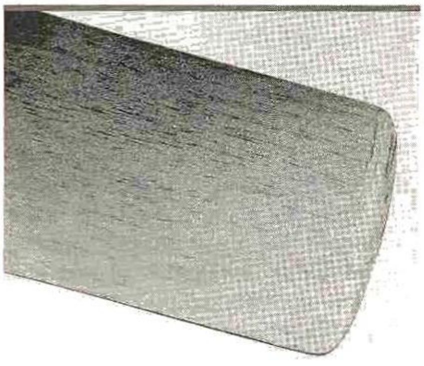


9 Brush the talcum/dope mixture onto the model and allow it to dry. Work quickly, as the mixture will set up in a hurry.

10 Lightly sand the airframe. Note that the talcum is not only easy on your skin, it smells lovely as well! If you can still see rough spots, repeat steps 9 and 10. That's it! The airframe is now primed and ready for the paint finish of your choice.

11 A note on repairs: when patching holes or repairs, *tear* the silkspan patch instead of cutting it with scissors. A ragged edge is much easier to blend into the surrounding surface than a cut edge. Simply tear the patch to size, lay it into place, wet it and dope it down. After the patch dries, apply two to three coats of thinned dope, sanding between coats. Then fill, sand and paint the patch. Wasn't that easy?



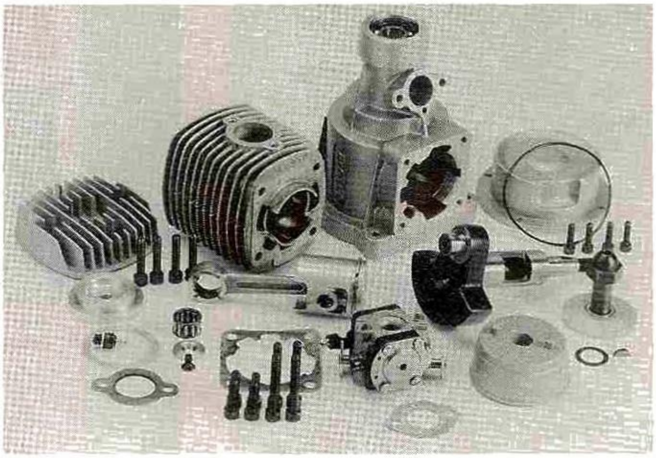


12 Here's the finished product. This covering technique is lighter than nearly any film, will never wrinkle and is quite easy to do. There's no trick to it!

RPM REAL PERFORMANCE MEASUREMENT

by DAVE GIERKE

OPS MAXI .30



Maxi 30cc engine components broken down for inspection.

OPS ENGINES are manufactured in Italy and are distributed exclusively in America by Great Planes*. OPS has been producing high-quality miniature engines since 1968. Today, OPS continues to produce engines that are capable of providing winning performance and offers 37 airplane and helicopter engines from 2.5cc (.15ci) to 60cc (3.6ci) covering the entire spectrum of events, including standard airplane, ducted fan, control line, pylon racing, helicopter and giant scale. This month, we're interested in the giant-scale segment of the OPS production line.

The 2-stroke, single-cylinder Maxi 30 (1.8ci) isn't a newcomer to the giant-scale scene. Introduced more than a decade ago, the engine hasn't set the scale community on its ear, although proponents stubbornly extol its virtues. Detractors focus on the engine's size and weight—not its performance. This interested me. How well does the engine perform, and what effect do its perceived deficiencies have on its ability to measure up?

The Maxi 30 comes packaged in a large red box with a 90-degree exhaust-header elbow; header elbow flange with gasket and machine screws; metric Allen wrenches; pressure-sensitive decals; operating instructions; specifications sheet; warranty information; parts list; exploded-view drawing; and a color brochure of many of OPS's other engines.

The assembled OPS Maxi 30cc engine with exhaust adapter and copper elbow header.

ENGINE CONSTRUCTION

What strikes you when you first see the 3.5-pound Maxi 30 is its massiveness: lots of deep cylinder and head fins with a large diaphragm-type pressure carburetor. The Maxi is a front-intake, side-exhaust design with the piston containing a single, tension-type compression ring. There are no beam mounts—only a compact and convenient radial unit cast into the rear of the lower block. The exterior components are all pressure die-cast; these include the two-piece block, cylinder head, backplate, carburetor body and large crankshaft drive washer, which has a cylinder of hardened and ground steel cast integrally into the removable upper block.

Possibly the most significant feature of the engine is the connecting rod; it's a phosphor-bronze forged part that contains caged roller bearings at both ends. Although significantly heavier than a plain bushed unit, anti-friction bearings allow the engine to operate with only 5 percent (by volume) castor oil in the fuel. Fortunately, the relatively low rpm range of these large engines limits reciprocating inertial loads, which increase exponentially as the square of rpm.

It's interesting to note that the caged roller assembly is retained on the crankpin by a machine screw that has a left-hand (counterclockwise) thread; this prevents it from loosening during normal counterclockwise propeller rotation (as viewed from the front). The upper caged unit is trapped between the piston's wristpin bosses. The wristpin is retained within the confines of the piston by music-wire retainer clips of conventional design; these snap into grooves at either end of the wristpin hole.

The cylinder bore tapers outward slightly from top to bottom (0.001 inch), allowing a cold clearance between the piston skirt and cylinder of 0.004 inch at BDC (bottom dead center). Above the ring, the clearance is much greater—0.010 inch, which is standard practice in most ringed engines; the technique ensures that the top corner of the piston doesn't snag a cylinder port. Viewed from the top, the small annular gap also allows compression gases to flow behind the ring, and this forces it to seal against the cylinder wall.

The head design corresponds to small-engine practice in which a button-type aluminum-alloy insert is retained by the finned, pressure-

die-cast head. After careful measurement and calculation, I was surprised to learn that the Maxi is truly "maxi" when it comes to compression ratio. The effective compression ratio (calculated from exhaust-port closure) totaled 10.86/1, while the geometric compression ratio (calculated from BDC) was elevated to 13.51/1. These were the highest attained to date, and that left me suspicious about my measurement accuracy, so I did everything over again! Fortunately, the second exercise produced numbers that agreed closely with the first. Designed to run on FAI fuel (80 percent methanol and 20 percent castor oil), these engines usually tolerate more compression without adverse consequences such as detonation. "Detonation," as my friend Clarence Lee is fond of saying, "is the sound of frying eggs." Unfortunately, it can be cataclysmic to pistons, rings and all bearing surfaces. Although detonation can be subdued by richening the air/fuel mixture and/or reducing the propeller load, the surest method involves adding metal gaskets (shims) between the button head and the top of the cylinder to move the head away from the piston. This increases the clearance volume and reduces the compression ratio. Happily, no detonation was experienced during the tests; consequently, compression-ratio modifications weren't necessary.

Two Schnuerle transfers, one on either side of the exhaust port, are angled steeply toward the opposite side of the cylinder in conventional fashion. Here, three boost ports aim acutely toward the cylinder head. What caught my attention was their total area: they're larger than the two transfers. This is unusual because transfer ports usually dominate.

A massive 2-piece crankshaft converts the reciprocating action of the piston into rotary motion while its full-web counterbalance handles balancing duties. Although adding significantly to the engine's overall weight, the crank's "flywheel effect" contributes noticeably to its smooth operation. The crankpin is individually machined, hardened and precision-ground prior to being pressed into place. This technique is totally acceptable with larger engine displacements because of their massive crankwebs, which offer stability against deflective loads.

PHOTOS BY DAVE GIERKE

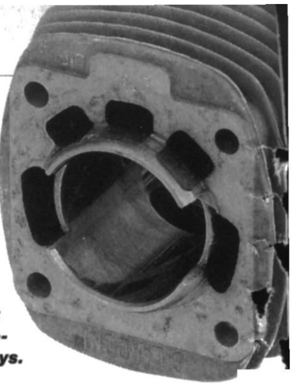
SPECIFICATIONS

Height	$6\frac{7}{8}$ in.
Width	$3\frac{3}{8}$ in.
Length	$5\frac{5}{8}$ in. (from the rear of the backplate to the front of the drive washer)
Mounting-hole dimensions	$2\frac{11}{16}$x$2\frac{11}{16}$ in. (radial mount)
Cylinder displacement	1.82ci/29.78cc
Bore	1.260 in./32.004mm
Stroke	1.4575 in./37.021mm
Bore/stroke	0.86/1
Stroke/bore	1.16/1
Conrod length	2.628 in./66.7512mm (center to center)
Conrod/stroke	1.8/1
Combustion-chamber volume @ TDC	2.38cc
Compression ratio	
—geometric	13.5/1
—effective	10.9/1
Carburetor bore	0.395 in./10.033mm
Weight (bare)	56 oz./1,588g
—w/muffler	65 oz./1,843g
Cylinder taper (TDC to sleeve bottom)	0.001 in.
PERFORMANCE	
Maximum torque	400 oz.-in. @ 5,200rpm
Maximum b.hp	3.3 @ 9,500rpm
B.hp/ci	1.8
B.hp/lb.	0.94
Oz.-in./ci	220
Oz.-in./lb.	114
NOISE LEVEL	
Muffler/tuned pipe	93dBa @ 6252rpm
Fuel	1% nitro, 7% oil
Propeller	22x8 APC
Sound meter	RadioShack no. 33-2050
Distance from engine	9 ft.
PORT AND INDUCTION TIMING	
Exhaust	
—opens	71° BBDC
—closes	71° ABDC
Total	142°
Transfer	
—opens	60° BBDC
—closes	60° ABDC
Total open	120°
Boost	
—opens	60° BBDC
—closes	60° ABDC
Total open	120°
Inlet (induction)	
—opens	35° ABDC
—closes	46° ATDC
Total open	191°
LIST PRICES	\$239.99 (Maxi 30), \$59.99 (OPS 1060 tuned pipe)

Features: caged roller-bearing connecting-rod (both ends); two-piece block (upper and lower); diaphragm-type pressure carburetor; two-piece button-style head; ringed-piston; Schnuerle with boost-port system of cylinder scavenging; crankshaft rotary-valve induction; and twin ball-bearing-supported crankshaft.

Hits
- Bulletproof, high-quality piston, rod and crankshaft components, featuring caged roller bearings on both ends of the connecting rod.
- Professional diaphragm-type carburetor whose size is matched by its no-nonsense positive performance.
- Massive cooling fins complement the engine's ability to utilize low lubricating-oil percentages.

Misses
- Fuel leak caused by faulty front crankshaft to front housing seal.
- Lack of factory-produced mufflers in the popular Pitts and conventional styles.



Upper half of the two-piece block assembly. Notice the cast-in, integral cylinder sleeve with multiple transfer and boost bypass passageways.

The current Maxi 30 is fitted with a Dell'Orot carburetor (Italy) that resembles the Japanese Walbro unit. These were originally used on industrial-type powerplants but have recently appeared on many model engines. The carburetor is rather large by conventional standards but fits in nicely with the Maxi, which was originally equipped with a model-type barrel unit. The new carb has a built-in diaphragm regulator and is pressure-operated directly from a small hole that communicates internally from the engine's crankcase; no external pressure lines are required. The fuel-tank location isn't critical, and fuel is delivered to the engine at constant pressure.

Helper Gary Caruso tachs the Maxi 30 from behind the American Hobby Products Mighty Engine Test Stand. Notice the concrete block used for ballast.

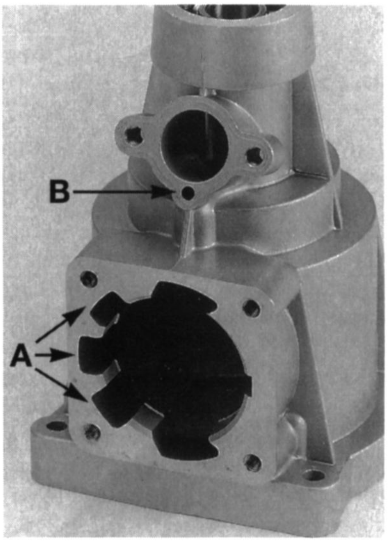
ENGINE OPERATION

Although the engine is provided with an exhaust adapter and "positionable" copper elbow, an OPS muffler isn't currently available in America. However, a Great Planes divergent/convergent tuned pipe (OPS1060) was designed for use with 5-percent-nitromethane fuels. The full-wave unit would undoubtedly boost the Maxi's torque and horsepower—making it a candidate for FAI pattern—except for the combination's prohibitive size and weight. Early in my evaluation of the powerplant, I decided to use an aftermarket muffler—one best suited to sport/scale applications.

Jim Bisson of Bisson Custom Mufflers* provided an example of the Pitts-style muffler that he manufactures specifically for the Maxi 30. All subsequent testing was conducted with this well-made, lightweight product. Great Planes also supplied the recommended glow plug (OPS RC no. 250, art. 9180); later, I discovered that the K&B* 1L also provides satisfactory operational characteristics.

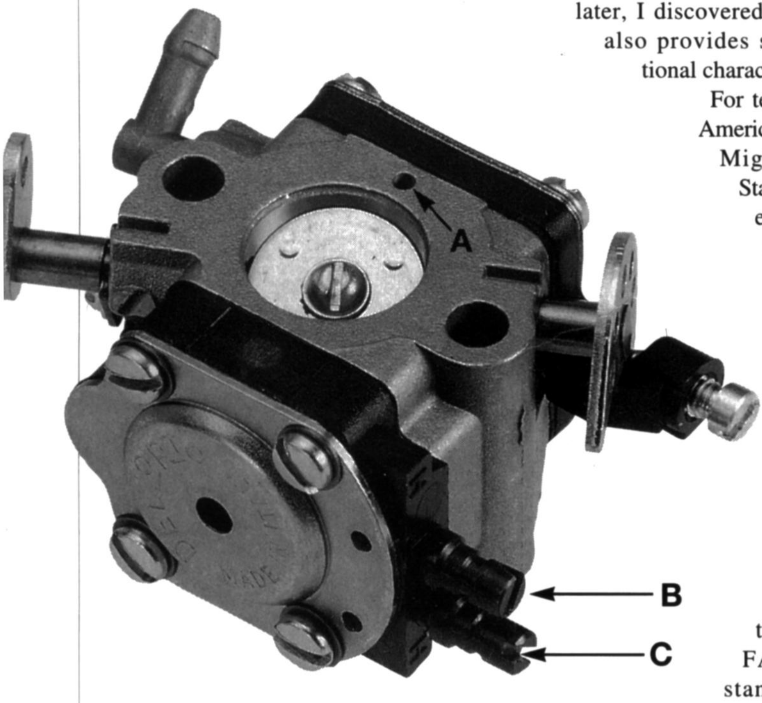
For testing, I selected the American Hobby Products* Mighty Engine Test Stand for radial mounted engines of 1.8 to 5.0ci displacement.

All tests were conducted with the following fuel blend: 1 percent nitromethane, 7 percent oil ($^{1}/_{3}$ Klotz* KL-200 synthetic and $^{2}/_{3}$ castor Klotz Beanol) and 92 percent methanol. OPS recommends the use of no-nitro FAI fuel—Europe's standard blend. I've found that a "squirt" of nitromethane won't adversely affect the performance of these high-compression designs; to the contrary, a little nitro helps achieve reliable idle and throttle-up function through the carburetor's mid-range rpm. Nitromethane is prohibitively expensive in Europe (it's $32 a gallon here!); that's why they don't use the stuff. I also boosted the oil content to 7 percent; my philosophy has always been that extra lube never hurts! The factory recommends a lube percentage of between 5 and 8 percent. This is possible because of the caged roller bearings on the rod and the exaggerated fins on the cylinder and head that provide excellent heat transfer and cooling. Smaller engines and units without these special features require higher percentages of lube to remove excess heat as the mixture moves rapidly from carburetor to exhaust; some experts believe that these engines are actually liquid-cooled. So be careful not to use the Maxi fuel in your sport .40!



Notice the three bypass passageways in the lower block (A). The internal pressure hole (B) runs between the carburetor and the crankcase.

The factory recommends a break-in period of about an hour using a relatively light load. I followed this good advice while using an APC* 20x8 propeller—a three-piece unit made of fiber-reinforced plastic with an aluminum-alloy central hub. I was initially skeptical about this unfamiliar

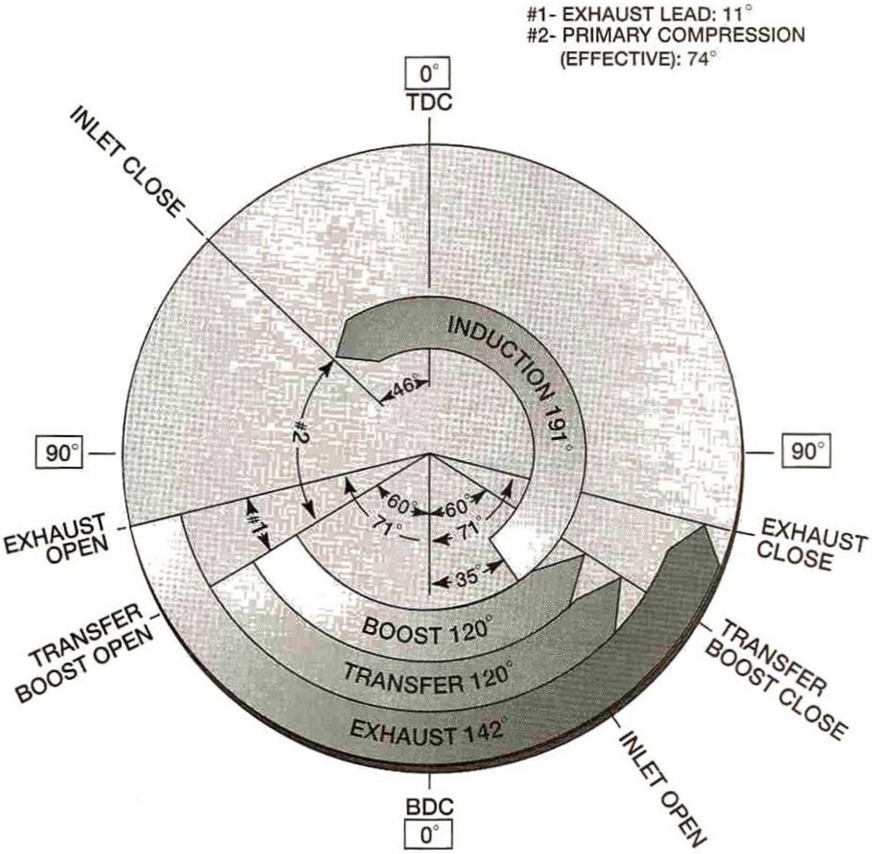


Bottom side of the diaphragm-type pressure carburetor. Notice the pressure hole that communicates with the crankcase of the engine (A); the low-speed needle valve (B); and the high-speed needle valve (C).

arrangement, but I soon discovered that it balanced perfectly and displayed little tip runout—less than 1/16 inch. Two no. 6 holes (5mm) were required in the rear of the aluminum hub to fit pins on the engine's propeller adapter (drive washer). Of course, if a one-piece prop were used, the rear of its hub would also have to be drilled. Throughout testing, the propellers ran beautifully.

Atmospheric conditions during the test were: temperature—62 degrees Fahrenheit; barometric pressure—29.61 inches of mercury (uncorrected); wet-bulb thermometer—55 degrees F. Overall, it was a better-than-average air-density day for engine running purposes.

INLET VALVE & PORT-TIMING DIAGRAM

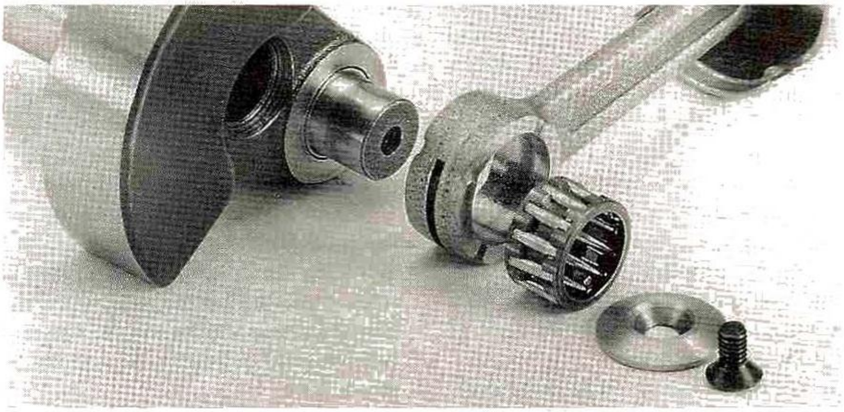


STARTING PROCEDURE

The Dell'Orot carburetor has high-speed and low-speed needle valves. OPS recommends an initial high-speed needle setting of five turns out from the closed position and a low-speed needle setting of three turns out. The company also recommends that all needle-valve adjustments be made with the engine stopped—a wise safety suggestion. After break-in, the engine required only three start/stops to achieve the ideal high- and low-speed settings.

Initially, hand starting proved to be difficult. Choking the carburetor while flipping the prop with a C.B. Tatone* starter stick didn't move enough raw fuel into the engine; a prime was required. This was accomplished by squirting half a dozen drops of raw fuel directly into the combustion chamber through the glow-plug hole. With the plug replaced, the engine started easily. An electric starter would have alleviated the choke-start problem, but I wanted to check the big engine's manual starting characteristics.

With the carburetor barrel adjusted to 1/2 throttle and the glow driver supplying current to the plug, starting was by the compression-bump method. Because of its high compression, the Maxi was difficult to crank through top dead center (TDC) with authority. I simply flipped the propeller backward (clockwise), allowing it to bounce off its compression point. The resulting counterclockwise kick coupled with the firing of combustion gases allowed the engine to start within two or three flips every time. The initial high-speed-needle-valve setting turned out to be very rich but was left that way for the initial run of 4 minutes; glow-plug heat was continued to ensure that the engine wouldn't quit. After shut-down, I leaned the high-speed needle about one full turn. Following a brief cool-down period, I restarted it. Although running more steadily, the mixture was still 4-cycling rich, which is ideal for all ringed engines during most of their break-in period. As break-in progressed, I occasionally checked the peaked rpm by using the pinch technique. This is accomplished by a series of momentary squeezes of the silicone fuel-delivery line that cause the air-fuel mixture to lean out. When used with a tachometer, an approximate indication of the engine's running-in progress can be obtained. When you stop pinching, the mixture returns to its rich, base-line setting. The Maxi 30 was operated in this manner for almost an hour without incident.



The massive crankshaft counterbalance and crankpin with caged roller bearing, retainer washer, left-hand machine screw, connecting rod and piston.

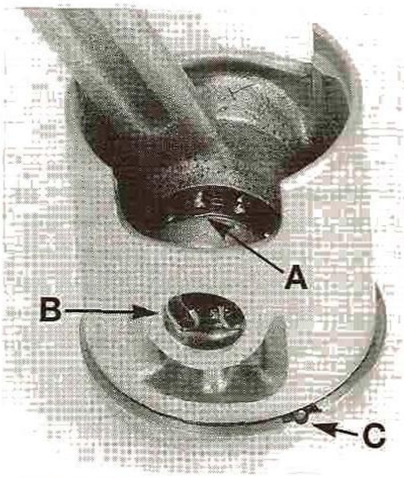
Some observations:

• With a rich low-speed-needle-valve setting, the Maxi idled at a very respectable 2,200rpm. When it was optimized, it dropped to a tick-over 1,800rpm.

• A fuel leak was observed at the crankshaft front ball-bearing interface; this occurs when excessive clearance exists between the shaft and the front seal area of the case (between the *front* of the carburetor's radial induction hole and the rear of the front ball bearing). Most often, this occurs when the *shaft isn't centered in its bore*. Leakage was timed at about one drop per second. The results are reduced fuel economy and a model whose nose is perpetually wet; some engines leak and others, often from the same manufacturing run, do not. If you purchase such an engine and its condition bothers you, I suggest you return it to the dealer, distributor, or manufacturer for replacement; it's faulty workmanship.

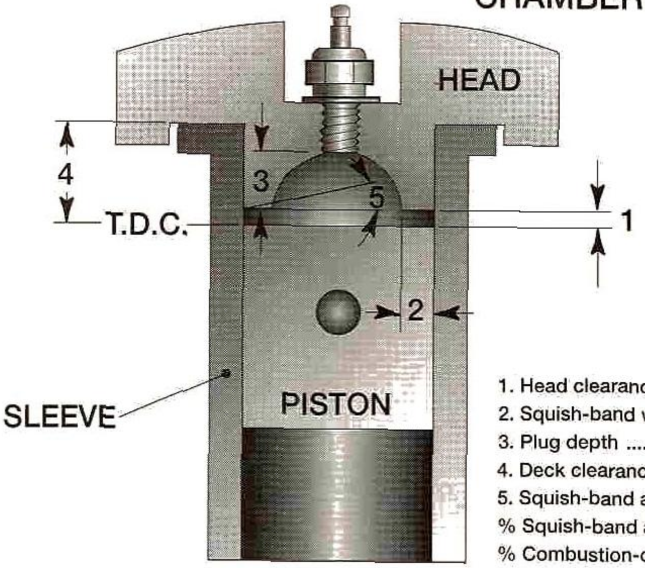
• When operating the engine on suction fuel feed, starting requires about *10 full* rotations of the propeller while the carburetor is choked. Although the carb acts as its own pump, adding muffler pressure provides a more reliable fuel-delivery system. OPS suggests the addition of a pressure fitting to the exhaust elbow. However, experience has shown that tapping pressure from the muffler's (or tuned pipe's) main expansion chamber provides a more reliable operation without the fluctuations attributed to small cross-sections or, to paraphrase Bernoulli: as the velocity of a fluid in a pipe increases, its pressure decreases and vice versa.

After break-in, the carburetor needle valves were final-adjusted: 3.5 turns out for high speed; 1.25 turns out for low speed. Peaked rpm for the 20x8 APC propeller was 7,200.



Industrial-strength piston and connecting-rod assembly. Notice the caged roller bearing on the wristpin (A). Music-wire snap ring retains the free-floating wristpin at both ends (B). A tiny music-wire pin positions the ring gap on the piston and prevents it from migrating into a port opening (C).

HEAD & COMBUSTION-CHAMBER DIMENSIONS



1. Head clearance ....0.024 in.
2. Squish-band width....................0.200 in.
3. Plug depth ....0.1825 in.
4. Deck clearance ....0.122 in.
5. Squish-band angle ....0°

% Squish-band area 53%

% Combustion-chamber area 47%

Prop	Rpm
20x8	7,200
20x10	6,500
20x12	6,000
22x8	6,250
22x10	5,400

This tells the story of how the Maxi 30 turned various sizes of APC propellers:

The engine turned all propellers smoothly and steadily, with the exception of the 22x10, which acted and sounded labored under too much load.

The noise level was checked at 7,200rpm (20x8 APC); I was surprised to find a loud 98.5dBa when measured at the standard testing distance (9 feet at 90 degrees to the shaft centerline on the exhaust side). With the 22x8 APC propeller, the dBa dropped to 93.5—a reduction of 5dBa, or almost two halvings (one quarter), of sound intensity (a very significant reduction in less than 1,000rpm). Because sound production from the Maxi 30 is very sensitive to *small relative changes in rpm*, I speculate that this was due to the 20x8 propeller's sound exceeding that of the exhaust. Although neither prop's tip speed is close to the speed of sound, such changes can push sound levels beyond those of the exhaust, and the loudest source is dominant. Only a comprehensive sound-analysis experiment can isolate the specific sources. (See "Hey! Keep the Noise Down!" in the December '95 issue of *Model Airplane News*.)

The engine was run on the dynamometer and found to produce 3.3b.hp at 9,500rpm. It generated a remarkably flat *torque curve* of between 4,800 and 9,800rpm. Its average torque was about 375 oz.-in. Although the horsepower peaked at a higher rpm, I found that it could be attained only with a relatively small load—equivalent to about a 16x8 APC propeller and probably too small to be considered for the model the Maxi would be expected to fly.

CONCLUSIONS

To some, the OPS Maxi 30cc is too large and heavy to seriously challenge the O.S. BGX-1 or the Moki 1.8. I believe that its size and weight provide certain advantages:

• In scale models, the engine is often buried deep within a cowl with minimum cooling-duct access; the Maxi 30 was designed to survive conditions that promote overheating; it has massive cooling fins and a caged roller-bearing-equipped connecting rod.

• Its ability to function happily with low percentages of lubricating oil means less exhaust residue will end up on the airplane, making it easy to clean.

• Although not the most powerful 1.8ci engine on the market, its 375 oz.-in. of reliable torque turns large propellers at moderate rpm and keeps exhaust and propeller noise in an acceptable range.

The OPS Maxi 30cc 2-stroke engine has been generally overlooked by the modeling community. In its updated trim, outfitted with a high-quality Bisson Custom Muffler and diaphragm-type pressure carburetor, it deserves a second look.

**Addresses are listed alphabetically in the Index of Manufacturers on page 126.*

SR Giant Scale!

If you're into Giant Scale aircraft, we've just introduced some new battery packs specifically for you!

Our new ***1600 Series*** pack replaces our 1500 Series pack that so many of you have chosen as the standard for Giant Scale aircraft. In addition, we've also updated our 1800 Series pack replacing it with our new ***2000 Series*** pack.

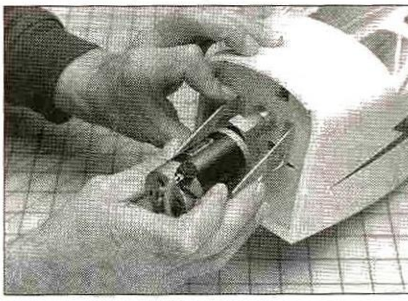
The exciting thing about these two packs is that they will give you much more flying time than a 1200mah pack yet they are no larger or heavier! *Both* the ***1600 Series*** and ***2000 Series*** packs weigh 7.4^{oz} and in a flat pack measures only 3.5" x 1.7" x .9" .

If what you really want is a 1200mah pack, no problem! We're also introducing our new ***1200 Series*** pack that only weighs 5.4^{oz} and in a flat pack measures only 3.5" x 1.4" x .9"! As you can see, it's much smaller and lighter yet it still gives you all the power you'll need for large aircraft with lots of servos.

In addition to our new packs, we've also added ***Volume R-7*** to the ***R/C Techniques*** library. Volume R-7 will tell you everything you ever wanted to know about the wiring of large scale aircraft. If you're not familiar with *R/C Techniques*, it's a bi-monthly publication we publish covering all phases of our R/C Hobby. We maintain a complete library of back issues so that you can catch up on anything you've missed. Here are the specific questions answered in *Volume R-7*:

- Why would you need a higher capacity battery pack?
- Why wouldn't you need a higher capacity battery pack?
- What size range is generally the best to use?
- Other than capacity, why else wouldn't you want to use a standard size battery pack on a Giant Scale aircraft?
- What does the internal impedance of the pack have to do with your pack choice?
- How low a voltage is too low?
- What charge rate should you use?
- Can you extend the charge time to make up for a charger that doesn't charge at a high enough rate?
- Why shouldn't you use a "peak detection" charger?
- Should you use a 4 or 5 cell pack?
- Why would you want to use a 5 cell pack?
- Why wouldn't you want to use a 5 cell pack?
- Why don't 5 cell packs give you more flying time?
- What wire size should you use?
- How should you extend the leads on a battery pack?
- What size wire should be used for servos?
- Which is more important, the battery pack lead or the servo leads? Why?
- Should you ever use an aileron extension to extend a battery pack lead?
- Is there a better type of system switch?
- Why should you only use "slide" switches?
- How can you use double switches?
- What cycler and ESV loads should be used on larger packs?
- Which battery backup systems are best?
- Do you really need one?
- How can I power the receiver from one pack and the servos from a second battery pack?
- What receiver modifications are necessary?
- What size pack should be used to power the receiver?
- What size pack should be used to power the servos?
- How shouldn't you power accessory items such as smoke pumps and ignition systems?

The best part is that ***Volume R-7*** of *R/C Techniques* is only $3 including postage! We'll even include a complete index to both the *R/C Techniques* library and the *Electric Flight Techniques* library at no extra cost!



By the way, ***Volume E-14*** *of Electric Flight Techniques* gives you complete instructions and plans for converting the Hangar 9 Giant Scale Cub from gas to electric power!

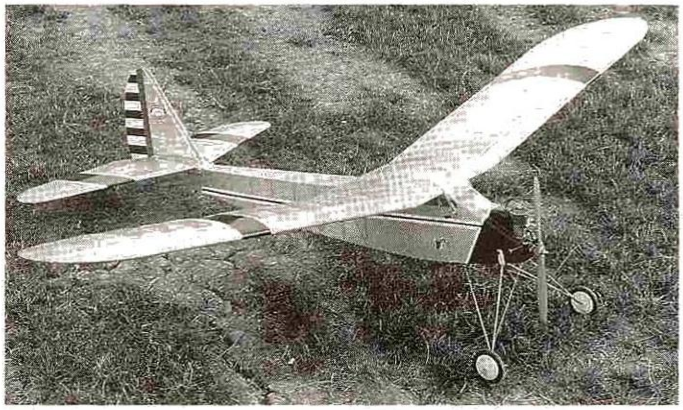
Call us if you have any questions or to place an order. You can reach us at SR Batteries, Inc., Box 287, Bellport, New York 11713. Our phone is 516-286-0079 and our fax is 516-286-0901. Our Email address is 74167.751@compuserve.com .

-ADVERTISEMENT-

Golden AGE OF R/C

by HAL deBOLT

THE CHET LANZO STORY CONTINUED



Tom McCoy's replica Lanzo RC 1.

WE'RE STILL ON THE TRAIL of the men who pioneered our wonderful sport: Clinton DeSoto, the Good brothers and Chester Lanzo. We've discussed the contributions of DeSoto and the Goods and began the Lanzo saga last month. So Chet Lanzo's R/C history is now aboard.

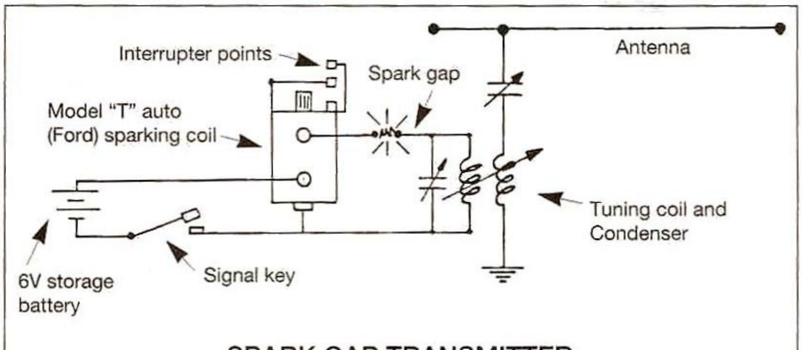
In the early '30s, modeling and radios were in their infancy. Vacuum tubes of that era were elementary in performance, used considerable power and did not meet R/C model needs. One of the previous methods of radio transmission consisted of a spark-gap transmitter in which radio waves were created by electrons jumping a gap. An early receiver used the Coherer principle; in short, the heart of this receiver was a container filled with metal flakes in a random pattern. When subjected to a radio wave, the flakes would reorient themselves and create a path for current to flow across.

Chet determined that the Coherer receiver would allow a much more compact and lighter airborne system than using vacuum tubes, so his first R/C attempt used this system. He spent considerable time getting his system operational and perfecting it.

Chester called his first R/C model the "RC 1." It was built in 1934, and flight attempts continued into 1935, but with no consistent success. One unexpected problem was that engine vibration sent the Coherer flakes wild! Sadly for Chet, this major effort was unsuccessful. Do note that the RC 1 plane would not look unusual on today's flightline!

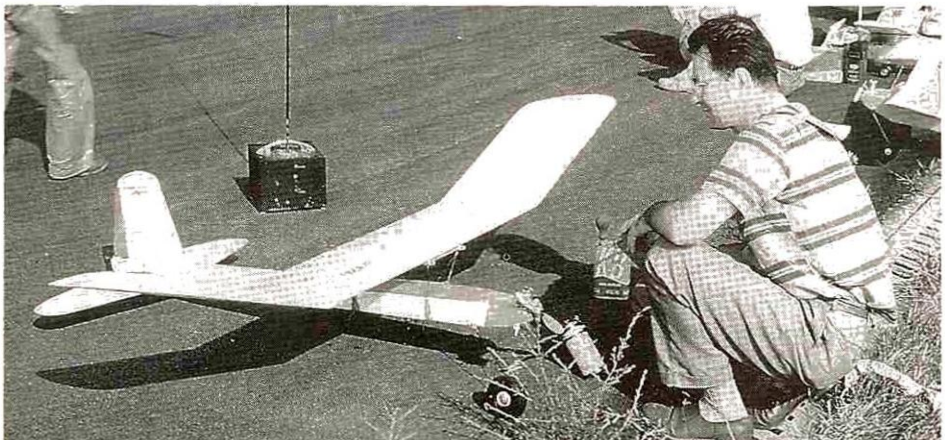
Continuing his search, Chet spent considerable time with tube-style radios. By 1936, he had not only created a usable system, but had also refined it to a then phenomenal weight of $1\frac{3}{4}$ pounds. Ever the practical modeler, he converted the R/C 1 to free-flight use.

Chet adapted a transmitter from the Ham-radio ranks for his tube system. You might say tubes of that day were "weak," and each had a single ability. Multifunction triode tubes were yet to come, so even minimum performance required three tubes, as Lanzo used. Needing to get the most from the least, obtaining sufficient receiver output depended on maximum reception by the receiver. A powerful signal from the transmitter was helpful; even so, its operation was "iffy" at best and, for success, all elements were critical. Battery capacity had to be max at all times, and tuning was of great importance; there was no room for error, and the R/C system required constant attention. Everything had to be working optimally before each flight—a most necessary requirement!



SPARK GAP TRANSMITTER

Because it was a cabin-style model, the RC 1's wing had to be removed for access to the radio—not convenient. Chet's practicality led to his so-called "Stick" R/C model. With access to the radio so necessary,



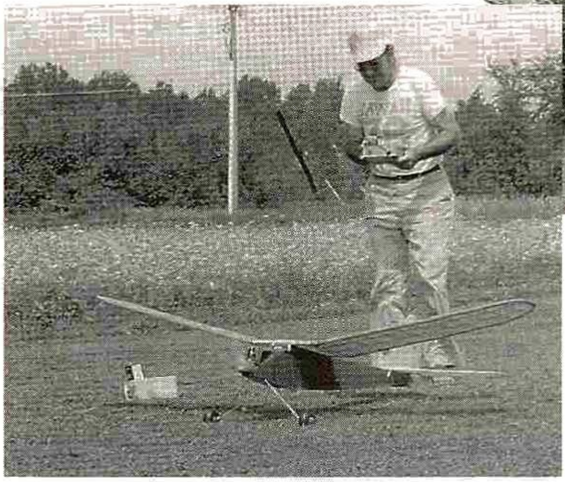
Chester Lanzo with his replica '37 Nats winner at a later Nats.

why not have the radio out in the open? The airborne components were installed in a tray, and a "crutch and stick"-style fuselage was tailored around the tray to allow optimum accessibility. Wire cabane struts supported the desired parasol wing. With a 9-foot wingspan, the Baby Cyclone-powered craft (on ignition) weighed only 5¾ pounds; this was very, very low when others considered 10 to 20 pounds a minimum.

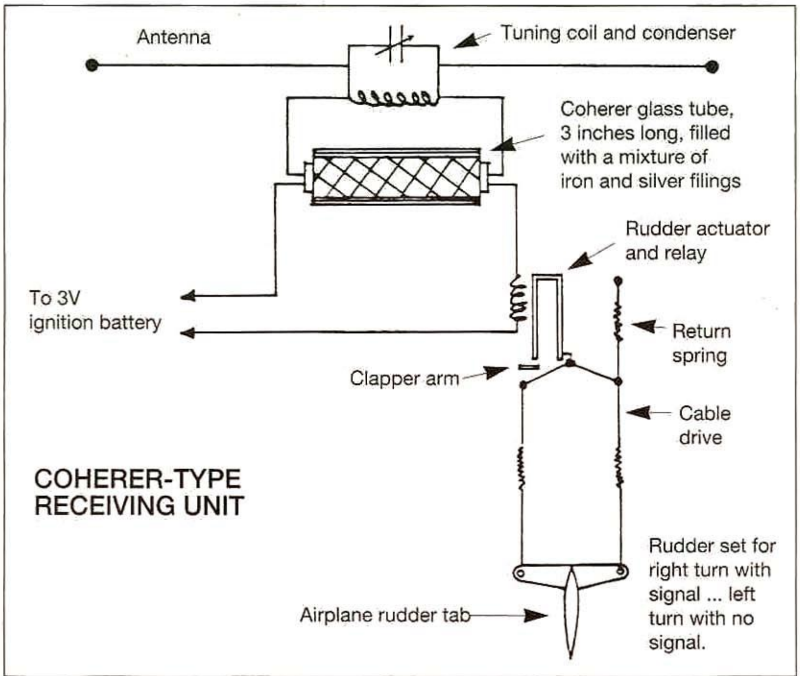
Chet never felt his win of the first R/C Nationals in 1937 Detroit with this model was anything to brag about; he thought the win was "the luck of the Irish" because no other entrant had managed to get a flight! This first R/C event was a one-day affair; a couple of early morning attempts by others failed to get airborne, but Lanzo's "Stick" did, and he was able to demonstrate some control before the engine quit after only ½ minute. However, he had an official flight while others did not! (Note: remember the Good brothers story? They were there with the successful Big Guff but were unable to get the needed 110V transmitter power until after the weather had turned sour.)

After that 1937 Nats, the Lanzo name was never again prominent in R/C. When I asked him why, Chet said it was a matter of priorities. He saw the effort with radios as a time-consuming chore; it hardly left him time for living, let alone other modeling desires. He had attained his original objective—to prove that a model aircraft could be remotely controlled—and it was time to get back to his cherished free-flights. Later on, when commercial R/C systems became available, Chet used them for many projects.


RC 1 on a landing approach.

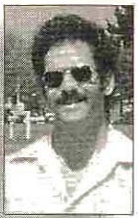

Chester launches his replica RC 1 for a flight in the '60s.

One last Lanzo R/C exploit occurred much later. Chet loved competition, and as any experienced competitor knows, it is worthwhile to look for loopholes in the rules to gain an edge. Chet's R/C experience had shown him it could be a distinct advantage to have control of a free-flight model. In competition, the model could be directed to obvious lift. Chet felt a demonstration of this would awaken the rules committee to the possibility that R/C would not be *true* free-flight.



For his endeavor, Lanzo took a retired cabin-style gas model, removed the engine and scabbed on a nose to make a glider of it. When he was assured that it flew OK, it was off to the Nats. There, he entered the free-flight towline glider event. Without announcing his use of R/C, Chet towed his glider aloft. Once airborne, he steered it over the runway and found the expected lift. Then it was just a matter of guiding the model up and down the runway, which resulted in a long flight time. Other participants asked what he was doing, and he replied that nothing in the rule book said the glider could not be remotely controlled. You can imagine the reaction: protest after protest and completely bewildered officials! What to do now? In the end, Chet had accomplished his purpose. After much debate as to whether R/C was good for free-flight or not, sanity reigned and free-flight was kept pure.

Chester Lanzo was a modeler's modeler—a quiet gentleman whose vision did much for today's modeling. He is sorely missed!



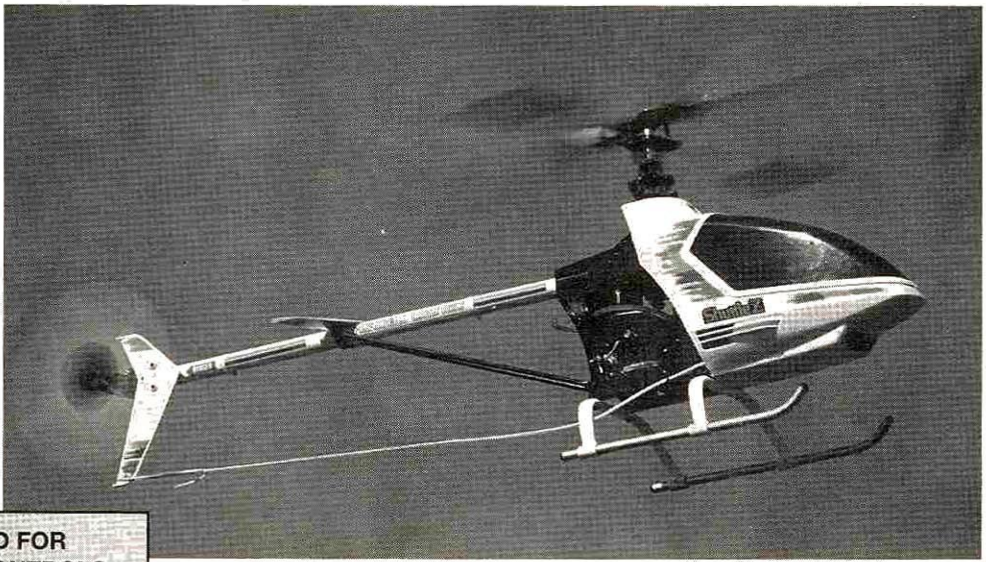
Effective PROGRAMMING

by DON EDBERG

SPECIAL HELICOPTER FUNCTIONS

LAST TIME, WE discussed special functions that you only find in programmable systems, with a slant toward fixed-wing models. This time, we'll concentrate on all the special functions directly related to rotary-winged models (otherwise known as helicopters, helis, choppers and copters—or other names that can't be printed here!). Those of you who are helicopter experts, please understand that I am trying to describe things in a simpler fashion.

I once had an instructor for a graduate-level course in helicopter stability and control who always used to say, "Helicopters don't fly; they beat the air into submission." Because the main rotor and the tail rotor blades all have to be controlled around each rotor revolution, there's a lot of truth to my instructor's statement!



TERMS USED FOR HELICOPTER CONTROLS

Aileron = Lateral (left/right) cyclic
Elevator = Fore/aft cyclic
Rudder = Tail rotor
Pitch = Main rotor collective

First, let's understand which controls are commonly found on helis. The main rotor on a helicopter does all of the lifting work, corresponding to a wing on an airplane. The direction that the helicopter flies is dictated by the tilt angle of the main rotor shaft, which is controlled by cyclic controls that make it tilt in one direction or another. (Cyclic refers to the fact that the blades are commanded to change once per rotor revolution or cycle. If you need a better explanation, refer to a working helicopter or a book on helis.) When I refer to ailerons, I mean left/right cyclic control, which changes the rotor blades' pitch so that the rotor shaft banks to the left or right. When I speak of elevator, I mean the fore/aft cyclic control that makes the rotor shaft pitch forward or aft. Rudder refers to tail-rotor control, which controls fuselage direction just like a rudder. Finally, besides the normal throttle control, most (but not all) copters have a control called collective pitch. "Collective" refers to changing the pitch of all the main rotor blades at the same time; this causes the main rotor's thrust to increase or decrease, which causes it to climb or drop.

A few interesting effects are unique to choppers. The first we'll talk about is the effect of torque. Because the engine applies torque to turn the main rotor against its aerodynamic and bearing drag, by Newton's law, an equal force tries to rotate the body in the opposite direction. This is half the reason why a heli has a tail rotor: to keep the fuselage from rotating rapidly against the direction of the main rotor. (Note that there are solutions other than tail rotors to get rid of this problem. You can add a second rotor that turns in the opposite direction from the first, and the two rotors don't even have to be on top of each other; next to each other works fine. Or, you can drive the rotors directly from thrusters or jets in their tips, so no power is transmitted across the main rotor shaft.)

The other half of the reason the tail rotor is needed is for maneuvering; you might think that a regular fin and rudder would work, and they will, as long as the chopper is moving forward. When a chopper is hovering, however, a conventional control is useless because there's little or no airstream flowing over it, and you need something that can push, even when the copter isn't moving. The tail rotor is such a beast, and to yaw the fuselage to the right or left, you just increase or decrease the anti-torque thrust a bit to get it to go where you want. Rudder is just collective control on the tail rotor.

Now, let's think about the main rotor. If you want to climb, you need

to increase the lift produced by the rotor, and this can be done in one of two ways: you can increase the rotor's speed or you can increase the rotor blades' pitch. Most of the time, we prefer to keep constant rotor rpm ("head rpm") and change the main blades' pitch.

One complication occurs because when you increase the blade pitch, you need to increase the throttle as well, or else the head will slow down. But increasing the throttle means more power is required, so there is more torque, and the fuselage tends to yaw. So when you increase blade pitch, you end up applying rudder at the same time to keep the fuselage straight.

Since all helicopter controls and functions are driven by the engine, it's now clear that there is a complex interaction between commands and engine speed. When trying to climb, you slow down the engine and cause the fuselage to yaw. Obviously, radios should automatically handle all these interactions ... and helicopter radios do!

The heli computer radio allows the tail rotor to move automatically to compensate for the torque change whenever collective pitch is commanded. This function automatically slaves the throttle servo to the collective pitch so that both throttle and collective respond to the collective stick, and the rotor speed stays relatively constant at all power levels. These functions are shown in Figure 1. Throttle and collective are automatically slaved together once a helicopter program has been selected.

The first R/C helicopter I ever saw was a fixed-pitch machine (there was no collective control) that needed four functions: elevator, ailerons, rudder and throttle. Because engine rpm were the way to control climb, the pilot only had to feed in rudder with the added power to control the accompanying yaw. At the time, folks used straight 4-channel radios, so there was no tie-in to rudder. This meant that unless you provided the right amount of rudder, the fuselage would swing to one side or the other.

This problem was partly solved with the advent of helicopter radios, which brought a function called "revolution," or revo, that links the rudder to the collective stick and, when properly set up, automatically accounts for the torque/fuselage swings. This link is shown by the Collective arrow that points into Revo Mix, which points to Tail Rotor (rudder) in Figure 1. This helps with the steady torque problem, but the fuselage is still nearly free to swing back and forth; vertical tail surfaces don't help much here.

So the gyro was invented. This little device measures the rate of rotation of the fuselage and is connected between the receiver and the rudder servo. The gyro biases, or mixes in, with the pilot's command to the rudder to damp out rapid fuselage motion. In short, it makes the chopper into a manageable beast. The gyro adds damping, meaning that it makes the chopper fuselage yaw at a steady rate. Note that this damping is different from a heading-hold gyro, which keeps the fuselage pointing in a specific direction. Heading-hold gyros are now available and are becoming popular.

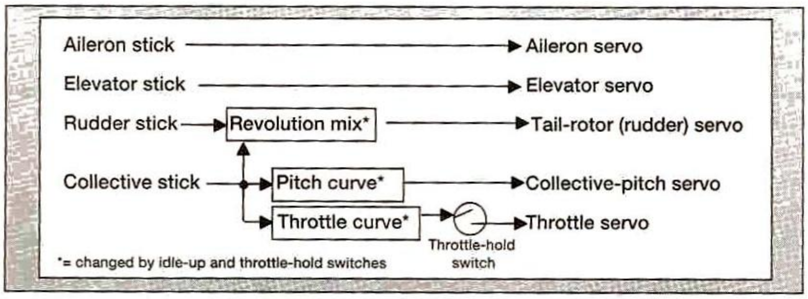


Figure 1. The helicopter control functions shown here are automatically active when you select a helicopter setup. Many more functions are provided for fine-tuning. (Some inexpensive heli radios do not include the pitch- and throttle- curve features.)

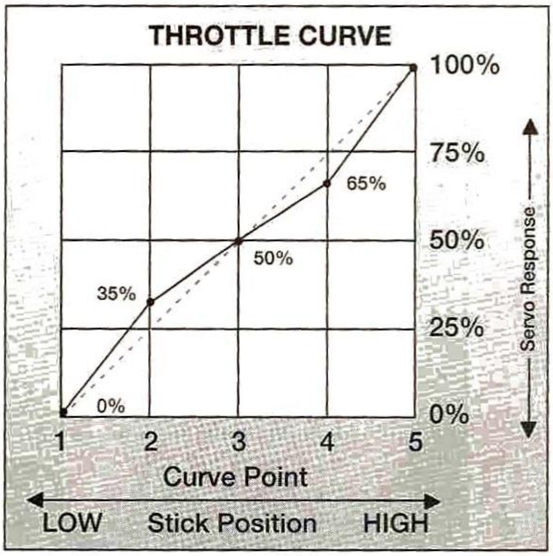


Figure 2. The throttle-curve setting is used to change the throttle response. The five-point curve shown here is steeper at the bottom, slower around hover (50 percent) and steeper at the top. (The linear response is indicated by dotted lines.)

Of course, in any flying activities, you have a tradeoff between stability and maneuvering. If you want to do aerobatics, you probably don't want to have the gyro, but for hovering and slow flying, you will want it. So, there is usually a provision on the gyro to accept another receiver input that can turn the gyro on and off with a switch on the transmitter. The fancier ones can even be set up with adjustable sensitivity, depending on another control or flight condition. We'll talk about this in a future column.

Normally, you set up the helicopter as specified in the kit's instructions. Servo travels should be limited electronically so there is no binding with any combination of controls. Main rotor pitch should vary between -2 and +10 degrees with full stick motion and should be verified with a pitch meter. Most heli radios provide a knob or lever to set the hovering pitch, which is defined as the pitch with the collective stick located at the middle of its travel (this is usually the desirable

hovering position). A value of +4.5 degrees is suggested, if you don't know what it should be. After the hovering pitch has been adjusted, you adjust the amount of throttle occurring at ½ stick; a hovering throttle adjustment is commonly available. You use hovering throttle to get the desired head rpm—usually specified in your kit's instructions—during hover.

Now comes the more interesting part. To fine-tune your machine's response, all but the most inexpensive systems provide pitch curves and throttle curves. These features allow you to deviate from the usual linear response of a control to one in which you select the amount of response (Figure 2). This makes things really interesting.

The curve options make it possible to select the way the particular control responds by choosing a series of points on a graph. Depending on the system, you may select either five, seven, nine, or even 13 (!) points along the travel to do your fine-tuning (the lower-cost systems have fewer points). Figure 2 shows both the linear response (the dotted straight line) and a five-point curve that has been input to get a different response. In this case, you can see that the throttle curve has been input so that it is steeper at the top and bottom and shallower around the middle (stick position 3), which makes hovering a bit easier, since it responds at a slower (shallower) rate. By the way, if the radio has pitch and throttle curves, there's normally a revolution curve as well (instead of a simple straight line).

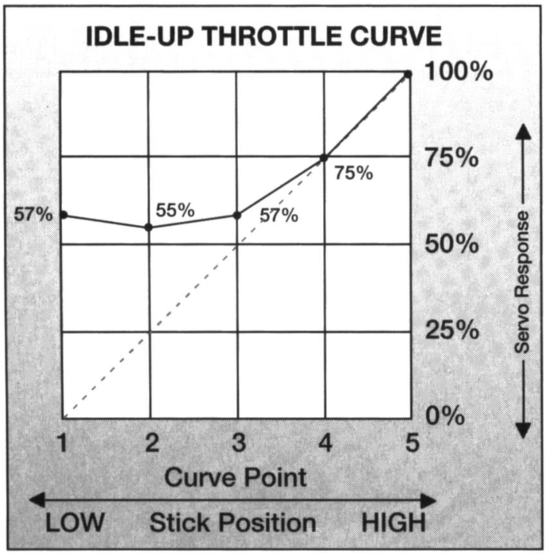


Figure 3. This five-point throttle curve, intended for aerobatics, keeps engine power over 50 percent, even with low rotor-head pitch settings (to the left of curve point 3).

AEROBATICS

So far, we've discussed the controls used for regular helicopter flying, such as hovering and forward flight. But this gets boring and, after a while, you'll decide that it's time to try some aerobatics.

As you might expect, the settings for hover are different from those needed for aerobatics. Heli radios provide a function called "idle-up" for aerobatics such as 540-degree stall turns, looping and rolling stall turns. Idle-up is activated by a toggle switch on the transmitter. On inexpensive radios, idle-up only turns on a rudder offset function that is set to trim the fuselage for hands-off, straight-ahead flight. On the more complex systems, idle-up also provides more sets of pitch, throttle and revo curves, along with fixed offsets to trim forward flight.

The idle-up pitch, throttle and revo curves are different from the default ones, so you can tailor them to the aerobatics you want to perform. For example, for maneuvering, you may want to have high throttle settings together with low pitch settings, so you would set the throttle curve as shown in Figure 3. Naturally, there are many more details and hints we don't have space for here.

AUTOROTATION

Autorotation refers to the condition in which the main rotor is unpowered. This can occur unintentionally, when the engine quits or flames out, or it can be practiced—so you'll be ready when the engine does quit! When you wish to practice autos, a command called "throttle hold" is used to disengage the throttle from the collective control (see bottom of Figure 1). Throttle hold is handy to use during autorotations because you can specify which throttle setting the engine should use (usually near idle, but fast enough to be sure it won't quit). This way, the engine is instantly available if you decide the auto isn't going well and you want to abort the attempt.

Note that both idle-up and throttle hold can override the radio's normal settings; when these two functions are off, the radio is set up for hovering and slow flight.

Properly set up, all of these functions can make it relatively easy to fly a helicopter. However, a helicopter radio is no substitute for proper trim and setup, a subject covered in several helicopter specialty books and videos that are available from this and other model magazines. You are encouraged to try one or more of these references; in general, they can save you a lot of time and grief!

In a later column, I'll tell you how you can use a programmable mixer so that engine power is slightly increased when inputs are commanded on cyclic or tail rotor, both of which take a little more engine power (and thus, will normally slow the head slightly).

The ultimate answer to maintaining head rpm is to actually monitor it and control it. Futaba now makes a governor (which, when the engine is not idling, is directly hooked up to the main rotor) that monitors engine rpm and adds throttle, when necessary, to maintain rpm. With that and a heading-hold gyro, the task of flying a helicopter has become somewhat easier!

Next time, we'll talk about sailplanes and the functions that a sailplane radio should provide.

OOPS!

In my February '98 column, I erroneously said that the JR 8103 has eight model memories. This is incorrect; it actually has 10 (which is where the middle of its name came from). My apologies for this dumb mistake!

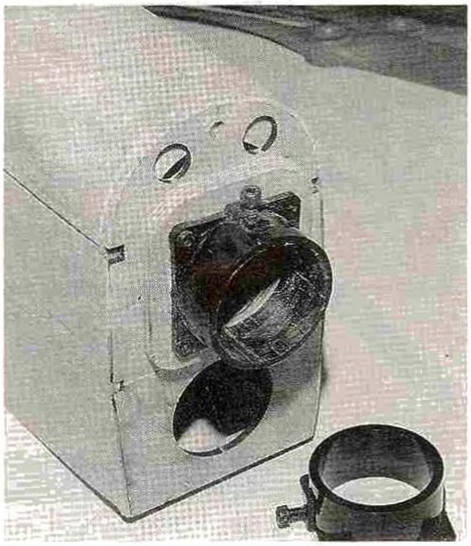
Remember, if you want to write me personally, send your self-addressed, stamped envelope to Don Edberg, 4922-P Rochelle Ave., Irvine, CA 92604, or you can email me at dynamic3@flash.net. I get lots of mail, so please be patient!

Current THOUGHTS

by GREG GIMLICK

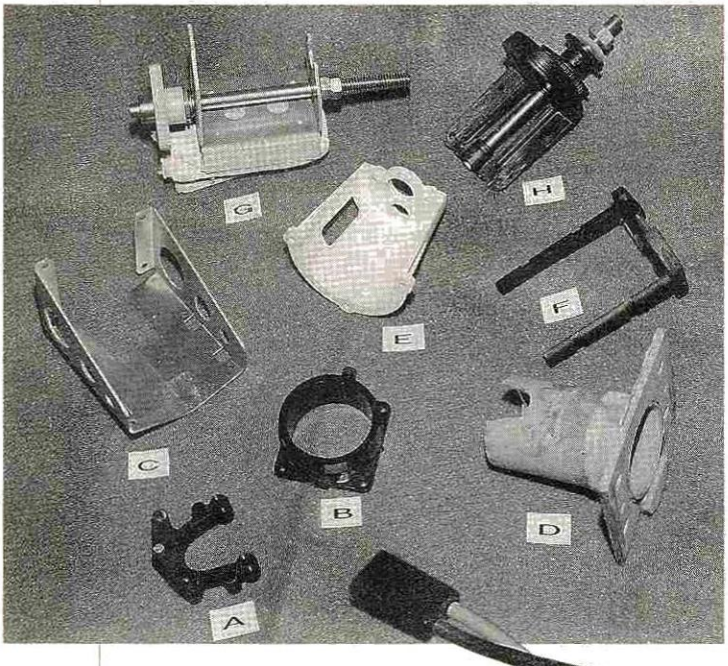
A MULTITUDE OF MOTOR MOUNTS

***Editor's note:** because of the enthusiastic response to* Current Thoughts, *I'm pleased to present Greg Gimlick, a long-time electrics flyer. He and I will be sharing the writing duties as we take this column monthly. I'll see you next month.—LM*



This AstroFlight firewall mount is installed in a Tiger Kitten.

A NEW FACE and name? What's happening? The fulfillment of a dream; I guess that's how I'd describe it ... writing for *Model Airplane News*. As a kid, I remember seeing the magazine in the hobby shop and marveling at the magic I saw within its covers (or at least I believed it to be magical; maybe I still do). After a brief rest since "retiring" from writing a monthly electric flight column in another magazine, Larry Marshall asked me whether I'd like to alternate months with him writing a column.



There are as many ways to mount your motor as you can imagine. Here are just a few: A—Kavan mount for AstroFlight motors; B—firewall mount from AstroFlight; C—Stitzer mount; D—Keith Shaw's scratch-built; E—Aeronaut mount for Graupner and Mabuchi motors; F—SonicTronics mount; G—gearbox/mount sold as part of Clyde Geist's Amp Air motor system; H—MFA belt drive/mount (distributed by Hobby Lobby and New Creations R/C).

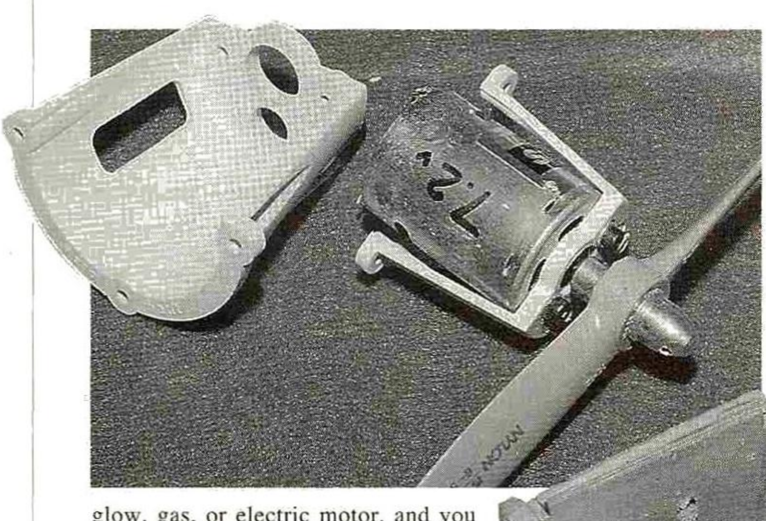
I'm a retired Army helicopter pilot who now performs his flights of fancy with model airplanes instead of real ones, and my main interest for several years has been electric flight. With my history as an instructor pilot and schoolteacher, I hope to bring you information on topics of interest and to remove some of the obstacles you may think stand in your way ... and have some fun in the process. As Larry and I develop the column, we'll cover as many aspects of this subject as we can, from the very technical to the very basic and, hopefully, we'll please the majority. Your input is crucial if we're to point the subject matter in the right direction, so be sure to contact us. I look forward to hearing from many old and new friends. Send your pictures and full descriptions of your setups so we can share them and continue to build a database of "what works."

MOTOR-MOUNT SETUPS

I'll start this effort off with a bit of information about mounting electric motors. I guess I've received more questions about this topic than almost any other, and it's one that seems to baffle almost everyone who first tries electric flight. The great news is there are as many ways to do it as there are questions on how to do it. There are many commercial mounts available along with ways of making your own to fit your particular application. That's one of the things I've come to love about electric motors: mounting them is limited only by your imagination and ingenuity. The most important thing is to be sure the motor is safely and securely held in place; I stress that you do not hold a motor in your hand and start it up to "feel the power" of a particular setup. I see this happen all too often at KRC, both in the pits and at vendors' booths, and it is begging for an injury. Torque is torque whether it comes from a

Stitzer's aluminum mount is available in various sizes; this one is used for Astro 25 and 40 motors.

PHOTOS BY GREG GIMLICK



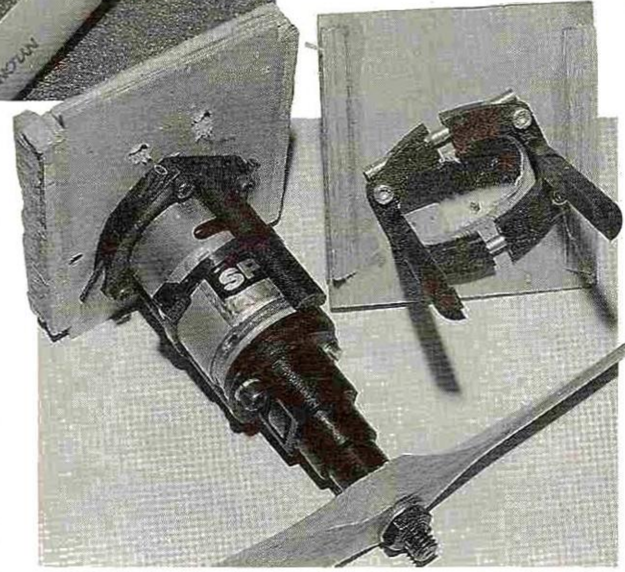
This Aeronaut mount is designed specifically to fit Graupner and Mabuchi motors.

glow, gas, or electric motor, and you should always treat powerplants with caution. Safety is key.

The opening photo shows eight mounts. All except the mount labeled "D" are commercially available; Keith Shaw covered it in an article a couple of years ago in *Model Airplane News*. We'll cover the commercially available mounts this month, and maybe we can devote some time to building your own in my next column.

Since Astro geared motors are popular, let's look at another mount that was specifically designed for them. The Kavan* mount for AstroFlight* motors is simply clamped around the gearbox and bolted to the firewall. This puts the entire motor behind the firewall, so you may need to plan to ensure there is room; most kits and plans assume the motor will be ahead of the firewall. Don't let that scare you, though, as it is easily done, and the motor is held very securely.

AstroFlight also makes a firewall mount that's designed to let the motor slide in from the rear, and a setscrew is tightened to secure it. This mount will also fit some of the "can" motors on the market and works quite well, but be sure to check the setscrew occasionally as it may loosen over time, thereby allowing the motor to rotate. I've used this type of mount with an Astro 40G on 21 cells spinning a 14x8 prop, and it worked well but it did scratch my motor when I failed to keep it tight and the motor slipped under torque. This mount is inexpensive and can be altered to eliminate the setscrew by cutting a slot in the barrel and using a hose clamp to secure the motor, eliminating the chance that the screw will mar the motor.

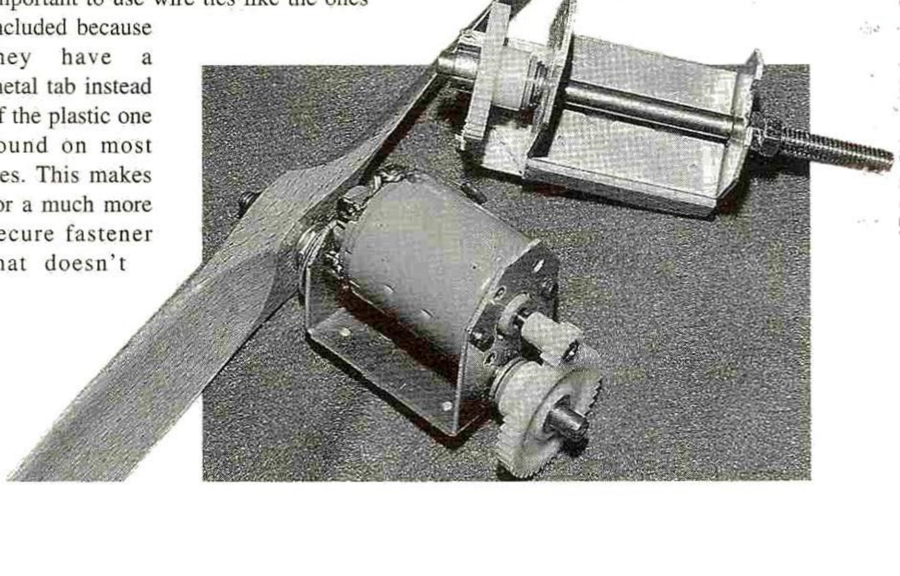


Adjustable SonicTronics mounts like this one are readily available at most hobby shops.

The Stitzer* mount is nicely constructed of aluminum and is available in various sizes. The one pictured is for Astro 25 and 40 or similar size motors. It puts the entire mount and motor ahead of the firewall and is attached by standard methods. The motor can be held in place with the supplied wire ties as shown, or clamped using Nyrod and bolts as described in the instructions that come with it. If you use ties, it's important to use wire ties like the ones included because they have a metal tab instead of the plastic one found on most ties. This makes for a much more secure fastener that doesn't weaken over time. A small hose clamp can also be used with this mount as there are provisions made in the base for alternate methods described in the instructions. One caution if you intend to use this mount: you must be certain there are no uninsulated connections in contact with the mount as they will cause a short. I've never had a problem with that, but it does bear noting.

Aeronaut* mounts are designed specifically to fit the Graupner/Mabuchi motors. These mounts are also bolted to the firewall from the front, but a hole is required to allow the portion of the motor that extends past the back of the mount to protrude into the fuselage. The ones in the photo alone show the sizes for the Speed 600- and 400-size motors, and you can see how the Speed 400 motor is secured to the mount using the included screws. Both sizes have a center hole that fits the front bearing housing of the motor, and the mounting holes line up for the appropriate size screw. Whenever you mount a motor using screws in the front of

This gearbox/ mount is sold in Clyde Geist's Amp Air motor system.



MFA developed this integrated belt drive/mounting system (distributed by Hobby Lobby and New Creations R/C).

the motor housing, be sure to rotate the motor shaft by hand and see whether the screws are contacting the armature inside the motor. This is a common mistake that will damage the motor in short order if you don't catch it now. These mounts are designed for direct-drive applications only.

The SonicTronics* mount is one of the most easily found mounts in local hobby shops; even shops that don't carry much in the line of electric-flight equipment seem to carry them. They are extremely versatile, as the motor can be adjusted fore and aft to help you balance your plane or fit the cowl perfectly. They are made of a composite material similar to that of the standard glow engine mounts and are adjustable to fit several size motors. The photo showing them alone lets you see how they are bolted to firewalls and the adjustment that can be achieved by sliding them open or closed on the brass tube between the mount halves. Be sure to do that adjustment before you bolt the mount to the firewall because that's what holds the final size in place. Once adjusted, the motor can be held in place between the concave arms by using a wire tie or a hose clamp. I've had good experiences with SonicTronics mounts, but if used in an application where the motor gets very warm (or hot), the ties can lose their strength, so I prefer to use hose clamps. The mount arms can also be cut to fit your needs and space.

The remaining mounts are commercially made gear drives and belt drives that have mounting provisions as part of their design. Both have holes in the bottom or rails that can be used to mount them directly either to a "tongue" (in the case of the gearbox/mount made by Clyde Geist* and sold as part of his Amp Air motor system) or to beam-type mounts. Many folks using the MFA mount (distributed by Hobby Lobby* and New Creations RC*) use glow-engine beam mounts and bolt the mount directly to them. Graupner* also makes similar gearbox mounts in various sizes, as does Modelair-Tech* in its belt-drive line; these are all designed to be bolted directly to beam-type mounts.

That should get you started thinking and planning; next time, we'll look at a few more commercial mounts and spend some time building our own. So instead of worrying about how you're going to mount that motor, just view it as "another opportunity to excel," and start building.

Remember, you can write to me at 1016 Camberley Dr., Apex, NC 27502-8107; email:ggimlick@mindspring.com.

**Addresses are listed alphabetically in the Index of Manufacturers on page 126.*

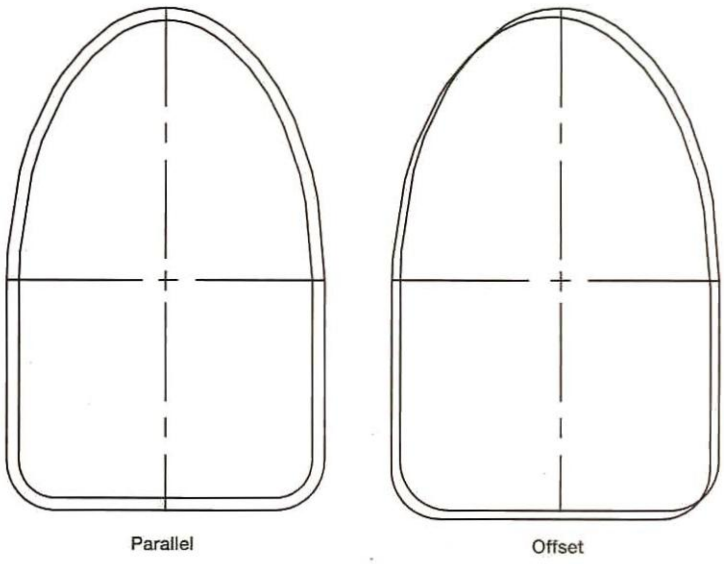
R/C CYBERNEWS

by JIM RYAN

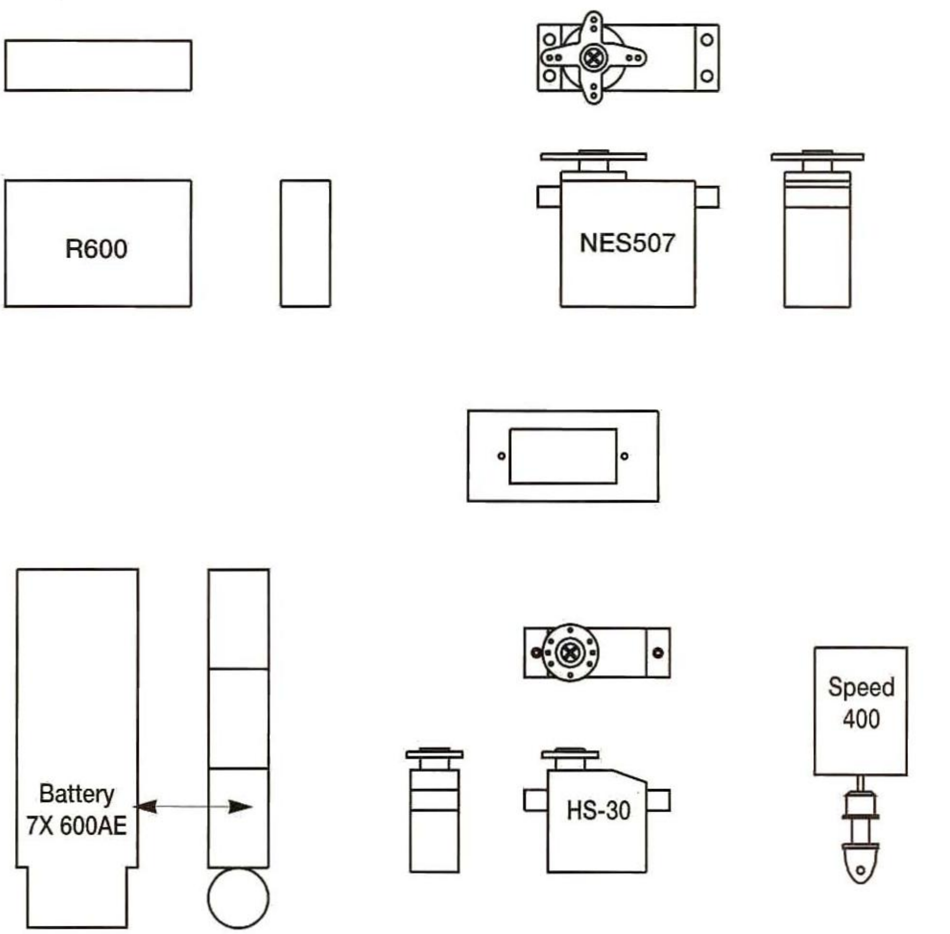
TURN 3-VIEWS INTO PLANS

OVER THE COURSE of the last few columns, we've discussed several practical approaches to importing a scale 3-view into the CAD environment as a basis for an original scale design, and we've looked at some general tips for reducing the structural weight of a model through careful selection of materials and stock thicknesses. Now, we're ready to put all this to use by turning the 3-view into a set of construction plans.

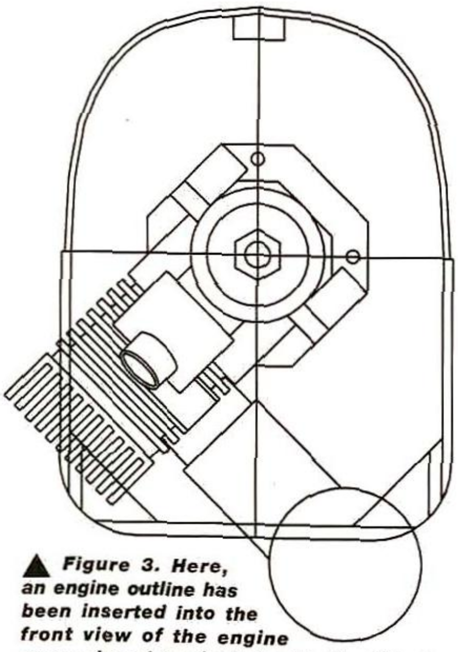
In this column, I have tried to avoid recommending one brand of software over another. There are many good CAD programs on the market, and which one you select is largely a matter of your computer platform, budget and personal preference. But there are a few features that are so important for using CAD to design a model that I would classify them as essential.



▲ ***Figure 1.** These two views illustrate the difference between the "Offset" command used in AutoCAD and the supposedly equivalent "Parallel" command offered by some lower-cost CAD programs. Note that rather than truly offsetting the curved former to allow for the thickness of the fuselage skin, the "Parallel" command has really just made a copy of the former a given distance from the first. The result is not useful for our purposes.*



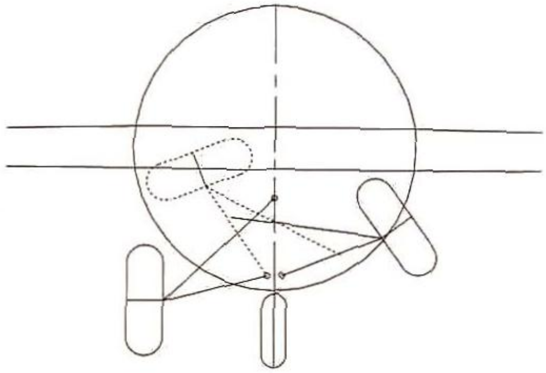
◀ ***Figure 2.** Here's a portion of the "hardware" file that I use for storing images of all the hardware that I use regularly. The servos, Ni-Cds, motors, etc., can be inserted into the new drawing as "blocks" and then dragged to the correct location.*



▲ ***Figure 3. Here, an engine outline has been inserted into the front view of the engine compartment to check for fit. The "Block insert" and "Copy vectors" commands can save a lot of labor in the long run.***

DRAWING LAYERS

Drawing layers makes it possible to keep all the information associated with a particular design in a single file without the plans becoming hopelessly confused. In practice, each layer is assigned a different color so it's obvious which entities are on which layer. Layers are a lot like drawing the plans on clear Mylar film and then stacking the sheets of film together. You can turn individual layers on or off just as you might remove a sheet from the stack, and the current drawing layer can be thought of as the top sheet. This is a great capability because the hardware can all be drawn on a single layer to make sure it fits inside the airframe, but then that layer can be turned off while you're printing formers so that the templates aren't cluttered with unnecessary detail. By the same token, dimensions and construction notes can be placed on a layer so they, too, can be turned off when not needed. You might draw a dense grid of construction guidelines on a layer and then turn that layer on or off, depending on whether you need it. The uses of layers are really only limited by your imagination.



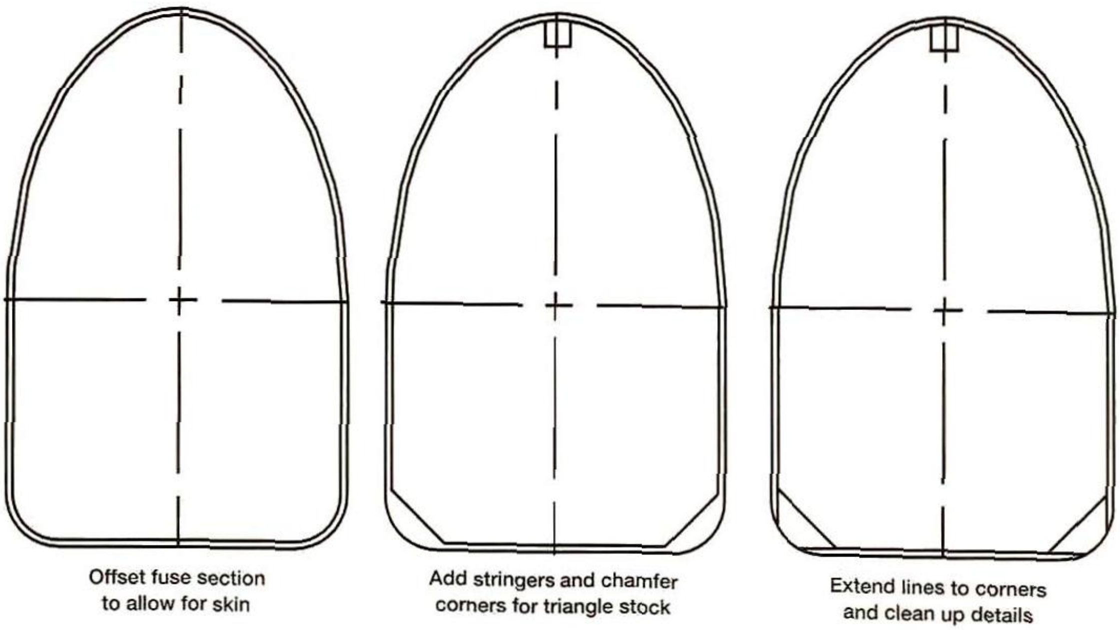
▲ ***Figure 5. This sectional view shows the retracts of my 1/12-scale X-1 moving through their range of motion. This allows you to look for interference before starting the actual fabrication work.***

THE OFFSET COMMAND

One of my favorite AutoCAD commands is called "Offset." This handy command allows you to produce a second line of any contour a given distance from an existing line. I use this command for all sorts of things, like setting the station points on the drawing, but it really shines when it comes to drawing formers and other similar tasks. You see, when you produced the 3-view, you drew fuselage sections, and as long as they're in appropriate locations, those sections make a natural basis for the actual formers. If your CAD system supports the "Offset" command (or something equivalent), all you need to do is offset the polyline that makes up the cross-section to allow for the thickness of your fuselage sheeting and add cutouts for any stringers or other reinforcement. Your former is complete (Figure 5). Isn't that easy?

Once you've drawn the formers, you can also offset the outline on the top and side views to allow for the skin thickness. As you get used to it, you'll see why "Offset" is my favorite command for filling in the internal structure in a CAD 3-view.

Figure 4. To convert a fuse section into a completed former, first offset the section to allow for the skin thickness; then add details such as the stringers. You can allow for triangle stock by using the "Chamfer" command. Finally, use the "Extend" command to finish the corners. ▶



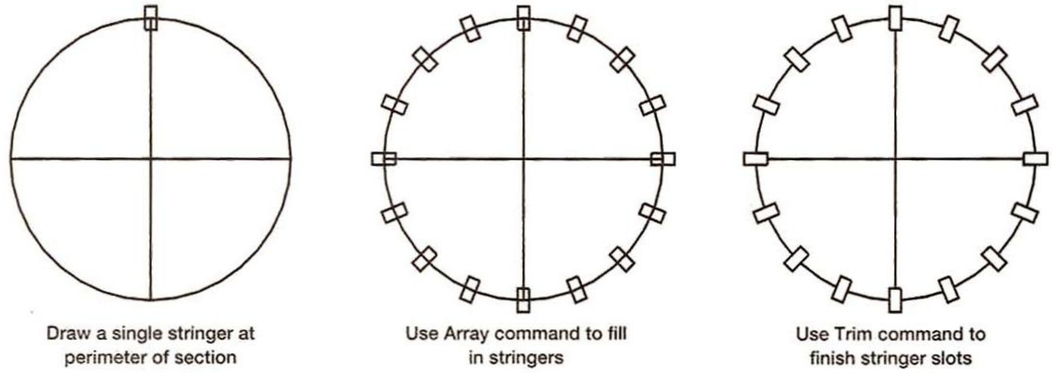


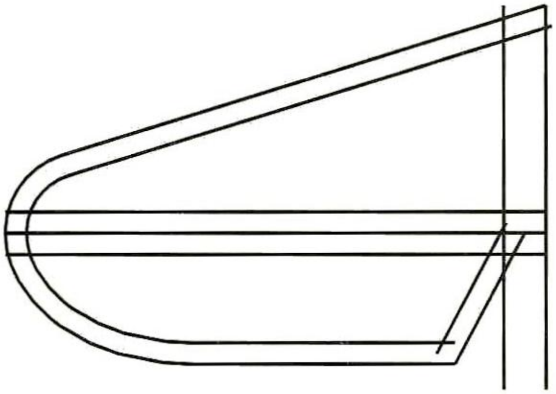
Figure 6. The "Array" command is useful for filling in the stringers around a fabric-covered fuselage such as this section from a WW I fighter. This can be a real labor-saver when you have several formers to plot.

BLOCK INSERT OR COPY VECTOR COMMANDS

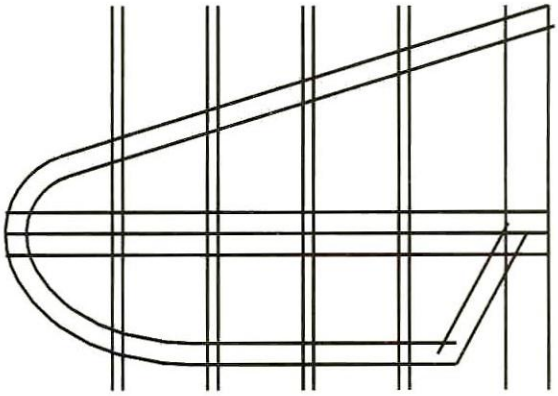
Another important command is variously described as "Block insert," "Copy/paste vectors," or simply, "Copy." This family of commands makes it possible to import a drawing entity from one file to another. One way this capability is useful is for arranging the hardware like the servos, engine and fuel tank within the airframe. Rather than laboriously drawing these components time after time, you can draw them once and store them in an archival drawing file called "Hardware" (Figure 2) and then import them into your new design as needed (Figure 3). My "hardware" file is a monster. It has grown to contain multiple views of every servo, receiver, motor and cell that I use in my models, along with generic servo mounts, templates for common foil sections and hardware such as hinges, control horns and clevises. Because the blocks or entities can be easily dragged and rotated this way and that, a few minutes of work now can save hours of head-scratching at your workbench later; you'll know where all the hardware fits before you cut the first piece of wood.

PUTTING IT ALL TOGETHER

Once I have the completed 3-view, I begin drawing the actual plans by drawing the wing ribs and formers (Figures 4 and 5). I generally import the foil sections from my airfoil plotting program as DXF files. A good foil plotting program will plot all the individual ribs for a built-up wing, and some even allow you to insert the slots for the spars, leading edges, etc. Note that when you get to designing things like retract mounts, CAD allows you to rotate the strut and wheel through their range of motion and look for signs of interference. Even when I don't need



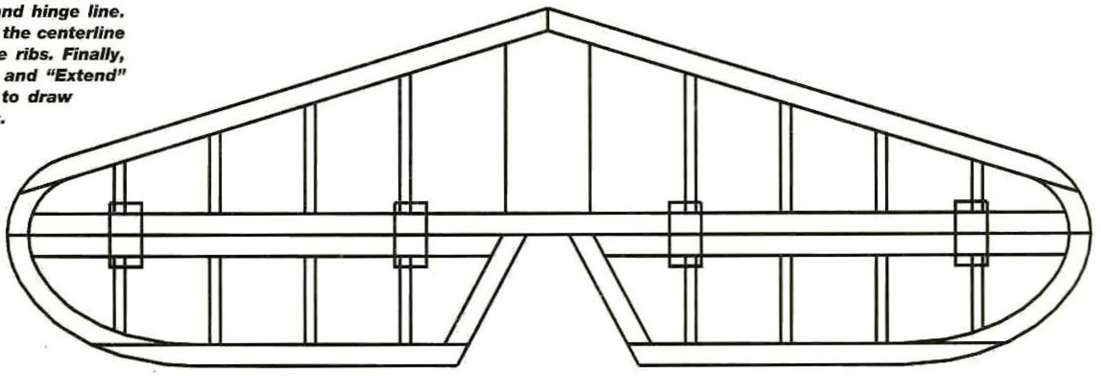
Offset perimeter and hinge line



Use Offset command to draw ribs

Figure 7. To draw framing for a stabilizer, begin by offsetting the perimeter and hinge line. Then offset the centerline to make the ribs. Finally, use "Trim" and "Extend" commands to draw in the joints.

Use Extend and Trim commands to draw lap joints

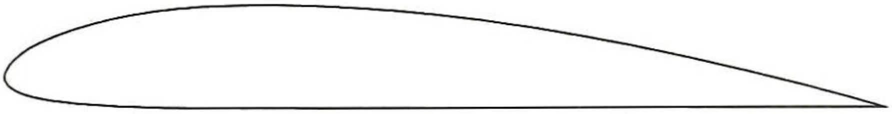


to, I do this because it looks so neat (Figure 6).

Drawing the stringer slots on the formers can be labor-intensive, but it's a lot easier than doing it with a pencil. Note that you can save the cross-section of a stringer as a block and insert it wherever you need it. For a circular fuse with stringers all the way around it, the "Array" command will draw evenly spaced stringers, all at the proper rotation, clear around the former (Figure 7).

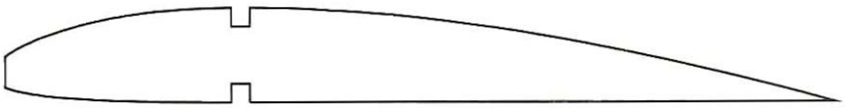
If the stab or vertical fin are built up, you can use the "Offset" command to allow for the width of the framed edges and then draw in the filler sticks. Use the "Trim" and "Extend" commands to define the intersections, and an hour's worth or more of cutting and fitting can be completed in seconds (Figure 8).

With the main structure drawn, I can now insert blocks with all the required hardware and check for fit in the top and side views. From there, you're down to the detail work like routing pushrods, inserting construction notes, etc. After that, it's time to cut wood!



Imported foil section

Offset foil to allow for skin thickness, then draw in leading edge and spars



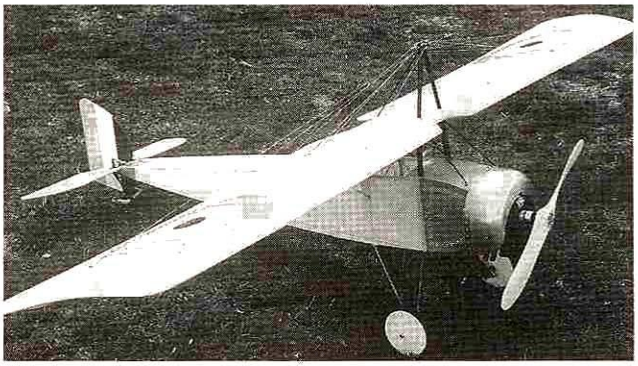
Erase skin and trim spar slots to complete rib

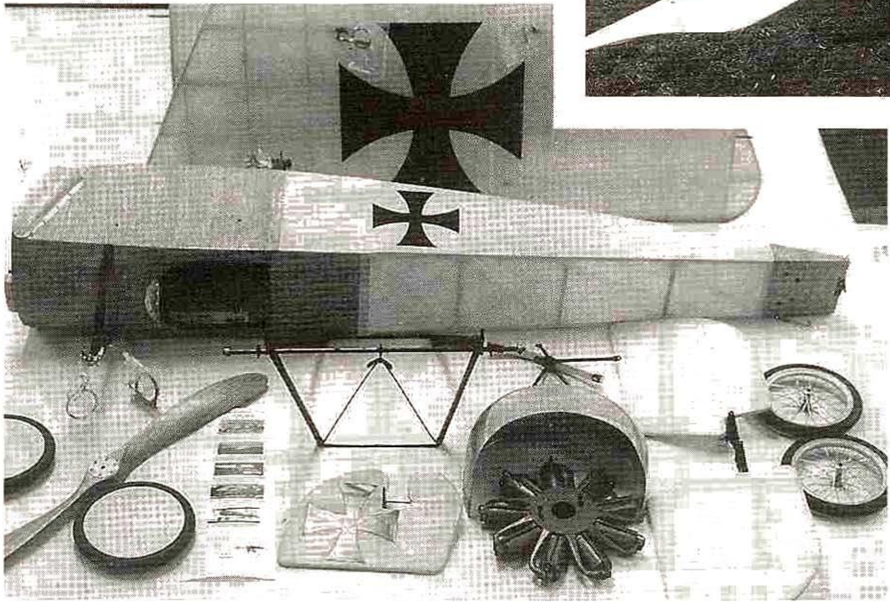
Figure 8. The wing ribs begin with a foil section imported from your foil plotter program. Scale the foil to the correct chord length and then offset to allow for the wing-skin thickness. Draw in the leading edge and spars, and then erase the outer foil and "trim" the spar slots to finish the rib. For a tapered wing, you'll need to repeat this quick process for each of the rib stations.

Scale TECHNIQUES

by GEORGE LEU

A LOOK AT WW I SUBJECTS



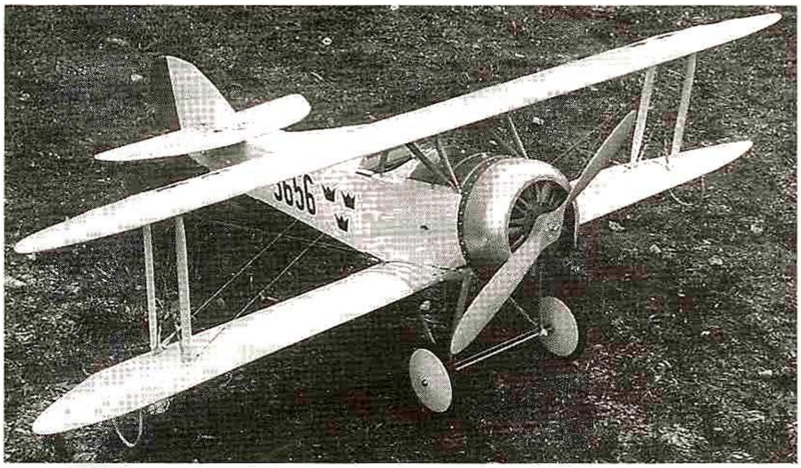


Above: for IMAA-legal action, this 3 Sea Bees Models 87-inch-span Morane-Saulnier Type L would really be cool flying over Rhinebeck!

Left: this is how one of the 3 Sea Bees Models ARFs comes out of the box—honest! As you can see, this 72-inch Pfalz E-1 comes completely covered and painted with rigging wires cut to length; the model is ready to be bolted together.

I became involved with flying R/C model airplanes because of my interest in history and my desire to fly WW I flying machines. I thought that if I could not fly the real thing, then why not fly a miniature replica? Over the years, my thoughts for new scale projects have often led me back to WW I models, and lately, it seems that I am not alone in this way of thinking.

A trend has developed in which scale WW I models are showing up in scale competition and doing very well. Kim Foster, Wayne Frederick, Ernie Harwood, Dick Hanson, Denny Deweese, Gary Parker and Tom Polapink are just a few of the well-known national competitors flying WW I subjects. These early vintage airplanes are also showing up at non-competition warbird events. But why?

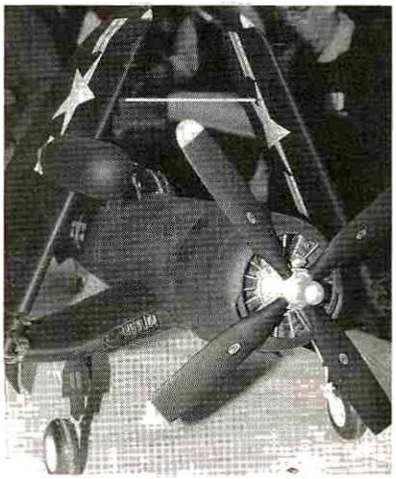


How's this for an ARF? This 1920 Swedish Tummelisa trainer is one of several superb, almost-ready-to-fly models available from 3 Sea Bees Models.

By talking with my flying buddies and various manufacturers at trade shows, I discovered an agreement that WW I subjects are on the increase. The answer to the "Why" question, however, is not easily defined by one specific reason.

WW I aircraft are certainly not fast subjects in the air. I would guess that 50mph is an average speed for most of the ⅕- to ⅓-scale models. Compare this to the average speed of a WW II fighter or jet model subject, and you see a large differential in the flight relaxation aspect alone.

One of the problems I remember from my early days of flying WW I aircraft involved what to do if the engine quits. Most of the earlier models were about ⅙ scale and were powered by .60-size glow engines turning 14-inch props. Most problems occurred when (not if) the engine overheated and died at an inopportune time, like when turning downwind or going around after missing a landing approach. Drag from the flying wires and blunt nose shapes usually meant a model glided like a brick and fell out of the sky like an elevator car.



Northwest Model Expo Best in Show winner Earl Aune's F4U Corsair in night fighter paint. This original design features functional folding wings.

Today, this is not the rule. Advances in engine setup and reliability of both glow and gasoline engines have given the WW I modeler encouragement to build that "drop-dead" scale subject. Propellers are also now available in many combinations of diameter and pitch sizes, making it hard not to find the correct prop for your engine/model combination. The benefits here are better climb performance and less overheating. Compared to 30 years ago, the WW I modelers I talk to today are a lot more relaxed when they fly.

KIT MANUFACTURERS

If you look, you'll see that there are quite a few kit manufacturers out there making WW I projects available to the modeling public. Some sources are: Proctor Enterprises*, which also offers the old VK line of WW I models and the ¼-scale S.E.5a designed by Duncan Hutson; Glenn Torrance Models*, with its ¼-scale Fokker D-VIII; and Hobby Supply South*, offering the Flair line of WW I aircraft kits. Plans and short kits of Mike Reeves designs are offered by Bob Holman Plans*. There are so many kits and plan packages available now that I think designing and scratch-building your own WW I design is quickly becoming a thing of the past.

ADVANTAGES

By design, earlier airplanes are much simpler to build, and there is very little fiberglass work to do other than the engine cowl. Other good points are that construction is basic wood—spruce, ply and balsa—and there are no retracts to install. Fabric finishes, while not as easy to apply as iron-on MonoKote, are a lot less labor intensive than duplicating a metal finish complete with rivets. Another important factor to consider is that it simply costs less to build a WW I model than it does to build a WW II fighter or a jet. Once you buy the plans or kit, there's little else to buy, excluding scale machine guns and vintage tires. I know my WW II fighter projects seem like bottomless money pits with all the gadgetry and mechanics needed to finish them.

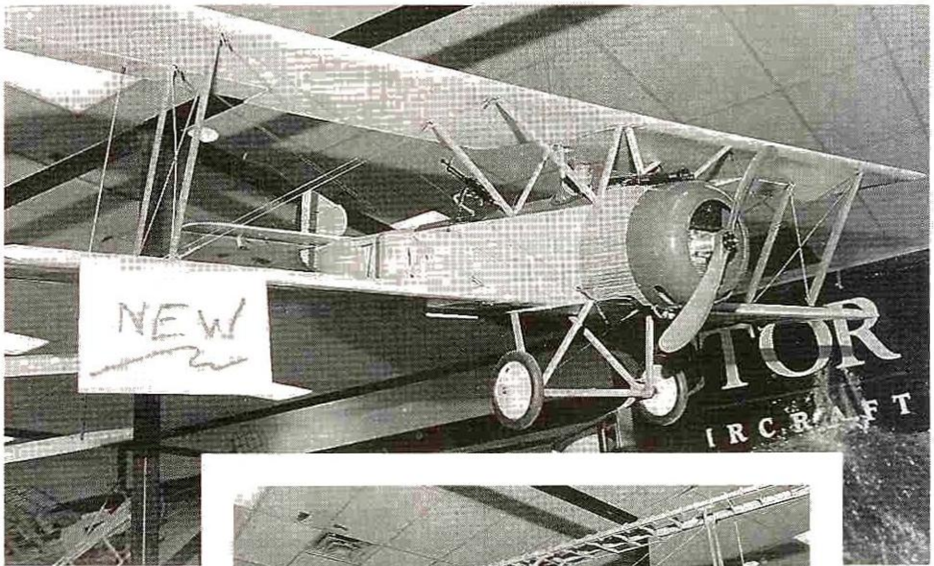
Competition flyers are finding that judges are becoming more knowledgeable about WW I aircraft characteristics. Static judges understand that the original airplanes were not very well maintained and that colors do fade and that wrinkles in fabric were common. (I'm not saying you can be sloppy in your covering application—far from it; it is best to say that the typical WW I finish was not perfect.)

DOCUMENTATION

Also compared to when I first started building WW I models, scale documentation is now much more readily available. Two sources that come to mind are Squadron Publications* and Windsock* Data Files. These provide good color and markings documentation prints and 3-view drawings for many previously difficult-to-document aircraft. Even the esoteric designs of the era can be found at such places as Scale Model Research*, and having this information makes it easier on the judges—a good thing! With a little work on your part, it is possible to offer just as good and complete a documentation package as it is for someone competing with a contemporary subject.

When it comes to flying a vintage model in competition, flight judges do realize that a full-size Fokker triplane did often ground loop on landing and that most older aircraft needed to dive to gain sufficient speed to complete a loop or a roll. I think that this proper understanding by scale judges that a Fokker doesn't fly like a Phantom is a very important factor in this increased attention to the older birds.

So there you have it. If you are on a budget or are simply tired of the expenses associated with heavy-metal warbirds, why not consider a WW I



At the Northwest Model Expo, this new VK Sopwith 1½ Strutter was on display in the Proctor Enterprises booth.

subject for your next project? When you look at 'em, they do have a lot more to offer than two wings, turnbuckles and flying wires.

THE NORTHWEST MODEL EXPO

Every January, I enjoy attending the Northwest Model Expo held in Puyallup, WA, just south of Seattle and near Tacoma. The Expo kicks off my R/C season and gives me an opportunity to visit with modelers and manufacturers who don't always make it to the Toledo show or the WRAM show in New York state. Attendance seemed down this year, but I bet the beautiful weekend weather had a lot to do with the lower number of modelers crowding the aisles. As always, there were some beautiful scale models in the static-display competition, and especially noteworthy was Best in Show winner Earl Aune's *F4U Corsair* in night fighter paint. This original design features functional folding wings as well as scale retractable landing gear and tailhook. Also on display was Bob Benjamin's electric-powered Taylorcraft BD-12 Deluxe. Powered by an AstroFlight 90 motor and 35-1700mAh batteries, the Taylorcraft earned Bob 31st place at the Scale Masters with a static score of 96 and a total score of 173.08.

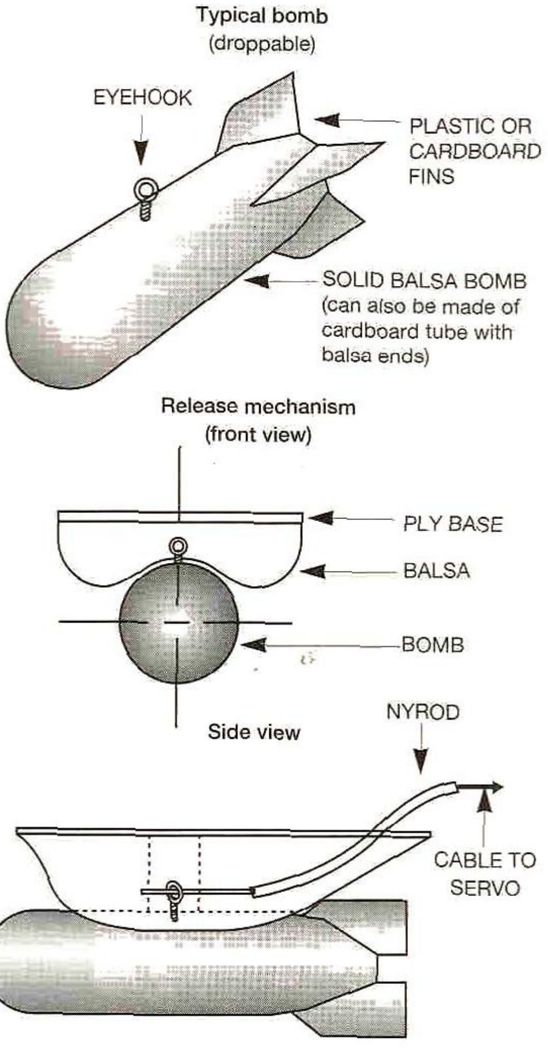
One of my favorite stops at the Puyallup show is the Proctor Enterprises booth; as I said earlier, I just like WW I aircraft. This year, Proctor showed off its newest model—a 1/6-scale Sopwith 1 1/2 Strutter, which will be sold under the VK name. The model employs similar building techniques to the VK Sopwith Camel and Fokker triplane. With a wingspan of about 67 inches and 51 inches long, the 1 1/2 Strutter is now the largest model in the VK line.

3 Sea Bees Models* is a new company I ran into at the show, and these guys had some really great ARFs—no no, not trainer ARFs, but some really neat-looking 1/5-scale vintage WW I and post-WW I stuff sold in true, almost-ready-to-fly fashion. The lineup consists of a 1920 Tummelisa Swedish trainer (63-inch span), a 1914 French Morane-Saulnier Type L (87-inch span), a 1909 French Blériot (64-inch span), a 1914 German Pfalz E1/E111 (72-inch span) and a 1917 U.S. Thomas Morse Scout.

Each kit comes covered with

Bob Benjamin is always to be seen at the Puyallup show, and this year, he had his electric-powered Taylorcraft BD-12 Deluxe on display. Bob placed 31st at the Scale Masters with his T-Craft.

Solartex fabric with a painted finish. All rigging wires have already been cut to length, and other nice things include scale-like wheels, dummy engines and a beautiful, static-display propeller. The models are also available as ARC versions, so you can finish them completely to your own documentation. Assembly time is about 12 hours before you can fly. These models are manufactured on an individual basis and require about 60 to 90 days for shipping. A $250 deposit gets you a production number, and the models are backed with a 10-day money-back guarantee policy if you aren't satisfied with your model. Did I hear someone say "Rhinebeck?"



INEXPENSIVE BOMB-DROP MECHANISM

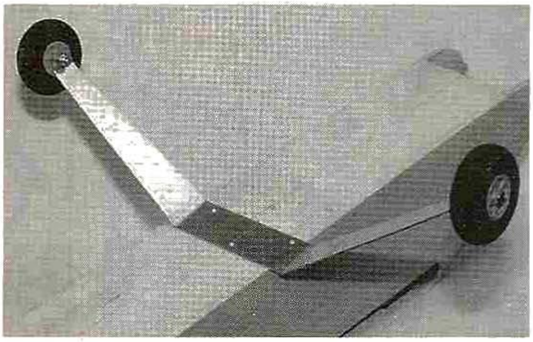
I sometimes make my own bomb-drop mechanisms because the commercially available units do not usually lend themselves to antique applications. Years ago, I noticed some teardrop-shaped release mechanisms on an S.E.5a at Rhinebeck. On close examination, they revealed a very simple working arrangement that I modified and have used without problem for many years. They are also very inexpensive to make. As the drawings show, the unit is rather basic and can easily be modified to suit your own application.

**Addresses are listed alphabetically in the Index of Manufacturers on page 126.*

Scratch-Builders' CORNER

by GEORGE WILSON JR.

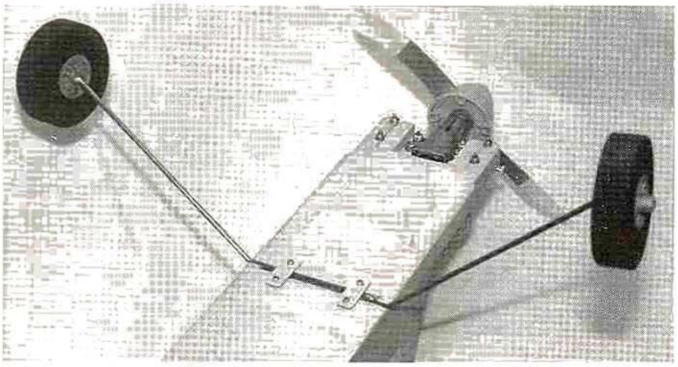
LANDING-GEAR ABCs



Typical bent, hardened, sheet-aluminum main gear. It will be attached to the fuselage using three 6-32 nylon machine screws that will break during a really hard landing.

THIS WILL BE A two-part series aimed at novices and covering general landing-gear principles. This month's column will discuss land gears, and the next column will cover skis and seaplane floats. The complications of retractable and scale gear have been omitted with deference to experts in those areas.

Land gear is of three types: tricycle (with a nose wheel), tail-dragger (with a tailwheel or skid) and the single wheel/skid used most often in gliders. The last type is relatively simplistic; it may be somewhat resilient but it is affected by only one rule: that it be mounted ahead of the model's center of gravity (CG) to ensure that the tail will be down when the glider is at rest. In this respect, single wheels/skids are like tail-draggers. Tail skids make ground maneuvering difficult, but swiveling or steerable tailwheels eliminate most of this problem. The swiveling or steerable nose wheel in tricycle gear provides improved pilot forward visibility and, for model airplanes, has the added advantage of being a propeller saver. Steep landing approaches are less disastrous if the nose gear takes much ofthe shock.



A typical wire single-strut gear, as shown in Figure 2. The parts of the struts that run across the fuselage act as torsion springs and help smooth out rough landings.

The ideal wheel position is directly under the CG. This allows the aircraft to pivot (seesaw) easily on the wheels and rotate to a positive angle for easy takeoffs. The actual position of a tail-dragger's CG, however, must be *behind* the main wheels to ensure that the tail is on the ground when the airplane is at rest. Similarly, the CG must be in *front* of tricycle-gear main wheels to ensure that the nose wheel is firmly on the ground.

Tricycle gear is used on most trainer models, and it is less tricky during ground handling. And don't write off a swiveling nose wheel, which eliminates a tricky steering linkage and still allows fair steering with the throttle and air rudder. Alignment of the main wheels does not require much precision, but its principles should be understood.

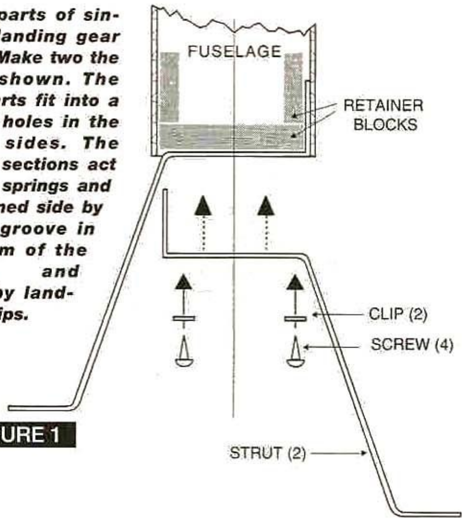


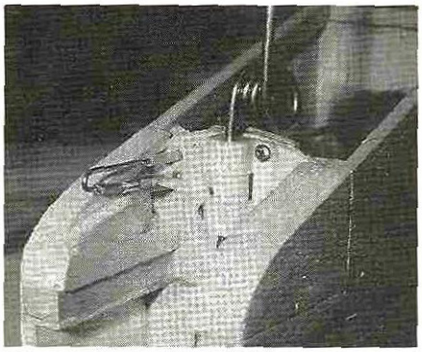
FIGURE 1

The wire parts of single-strut landing gear are alike. Make two the same as shown. The vertical parts fit into a groove or holes in the fuselage sides. The horizontal sections act as torsion springs and are contained side by side in a groove in the bottom of the fuselage and retained by landing gear clips.

Figure 1 defines the mounting angles of the wheels. The wheels often have a bit of positive camber while flying to allow for the gear's bending outward during and after landing. Ideally, the wheels should be near vertical when the aircraft is sitting on the ground. Camber and toe-in/out are similar in effect. Camber is the inward/outward canting relative to longitudinal axis of the aircraft. Toe-in/out is the canting of the wheels relative to the vertical axis of the aircraft. A degree or two of toe-in is recommended to assist in straight ground running. If one wheel bounces or becomes light when a wing lifts, the drag of the wheel that is touching the ground tends to turn the model toward that wheel's side. With both wheels on the ground, the toe-in of the wheels tends to cancel each other and cause only minimal drag.

Track width is the distance between the main wheels; usually, more is better. The wider the stance, the less the model will tip when wind lifts a wing. When the wheels are close together, the tendency for ground looping increases. This isn't often a problem because it occurs at relatively high speeds when air-rudder control is good. Note that rudder control is used on the ground. Many novices try to use aileron control, which is totally ineffective for ground steering.

Wheel size of functional (vs. scale)



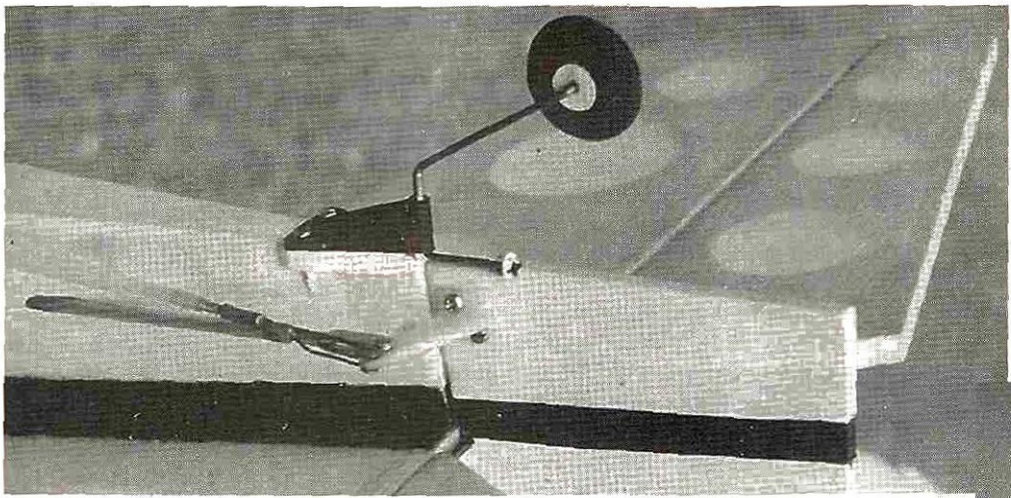
The steering linkage for a steerable nose wheel is shown here. Note the pushrod that reverses itself to provide easy attachment to the steering arm. Freely turning nose wheels also work well with a little practice, using the throttle and air rudder to blast the tailwheel around.

models should be chosen to match the roughness of the runway(s) where you will be flying. It's easier to negotiate rough runways with large wheels, but wheels of any size work well on smooth runways. Wheels that have tires with square cross-sections work well on grass runways. The difference between 2- and 3-inch diameter wheels in shortening takeoff roll is often dramatic. Wheels (and the model's structure) also absorb landing shock. Metal struts are deformed on impact and take on some of the energy, but give it back to the model as they return to their normal shape. Soft tires and true shock absorbers absorb energy, which is then dissipated. If you can't find the type of wheels you need, search the literature for articles on making some. A typical example is Guy Fawcett's "Make Light, Scale WW I Wheels," in August 1997 *Model Airplane News.*

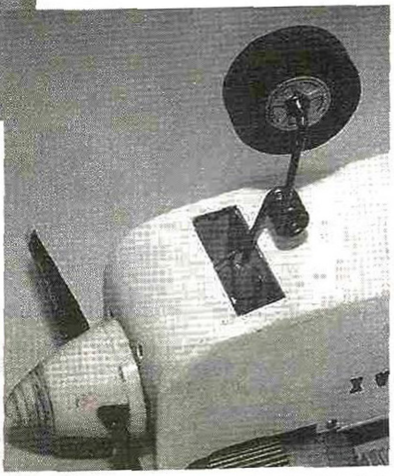
Tires in many hardnesses are available, from soft inflatable tires to solid hardwood tires. The ones most used on sport models at my field are low-bounce (energy absorbing) and soft-sponge types. Tailwheels should be narrow and have small-diameter tires to ensure good ground control on rough runways. Several steerable tailwheel mounts are available, and some of these include springs for shock isolation. In most cases, the tailwheel is linked to the rudder.

Steerable nose wheels are usually linked to the rudder servo on the side opposite the air rudder pushrod. Again, several nose-wheel mounts are commercially available. It's especially important to provide shock isolation between the nose wheel and the rudder servo because a rough landing can easily strip the teeth off the servo gears. Buy a shock-isolating coupler and mount it on the servo, or bend the nose-wheel pushrod (this also allows another method of adjusting the nose-wheel centering). As mentioned previously, a swiveling nose wheel is simple to make and, with practice, works well. A light centering device is recommended with this method to ensure that the nose wheel is straight ahead during flight. Besides, nothing is quite as pathetic as a model landing with its nose wheel at an angle.

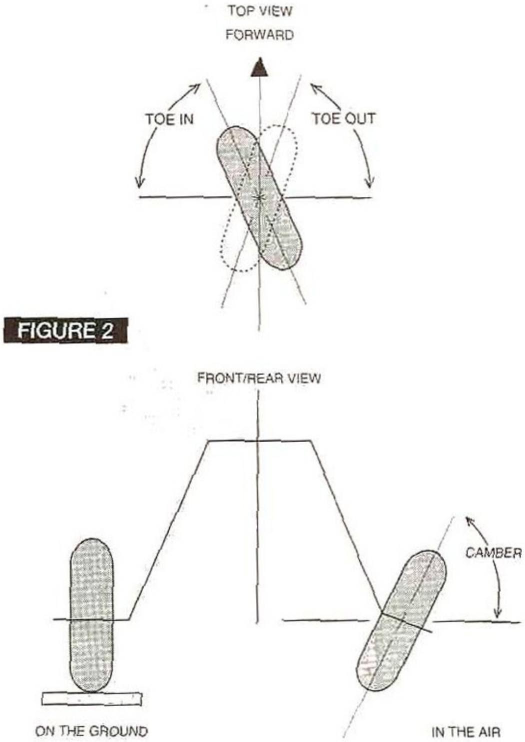
Struts and axles are the most important parts of landing gear. They should be strong and rela-



A tailwheel mounted on a bracket at the rear of the fuselage of an Ace R/C Bingo. The tailwheel is steered via a link to the air rudder. A flexible link helps isolate the air rudder from ground steering shocks. Note also the pushrod connection for a water rudder.



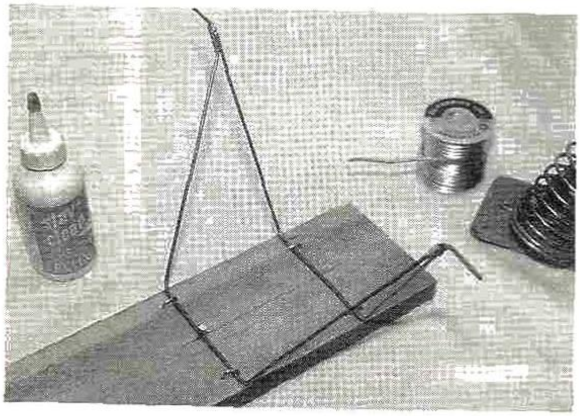
A typical steerable nose wheel emerging from the underside of the fuselage. The nose wheel should be raked backward to assist it in centering itself.



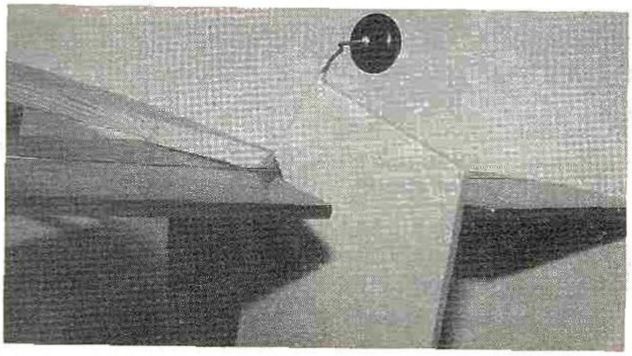
Landing-gear angles are defined in this figure. The angles are shown exaggerated to make them more apparent. In the case of models, camber and toe-in/out have similar effects. Toe-in is used to help maintain straight tracking when one wheel lifts. Camber should be adjusted to make the wheels perpendicular to the ground when the model is at rest.

PHOTOS BY GEORGE WILSON JR.

tively rigid, but flexible enough to ease the landing shocks delivered to the model's fuselage. Sheet-metal landing-gear struts are usually made from one piece of tempered aluminum of thickness suitable for the model's weight. These struts can be attached to the bottom of the fuselage using nylon screws that will shear off during a bad landing. You can make wire struts using two music wire legs on each side and with the cross wires attached to the fuselage bottom with landing-gear clips. I prefer to cut grooves in the fuselage bottom for the cross wires to ensure good alignment and use flat plastic clips that bridge the grooves (the plastic will break during a hard landing). This type of strut can be made by cleaning the wires with sandpaper, wrapping the joints (usually near the wheels) with thin copper wire, applying soldering flux to the joints and soldering using a heavy iron (100 watt is good).



Landing gear that uses more than one strut on a side can be soldered easily by cleaning the wires with sandpaper, wrapping the wire joints with thin copper wire, applying soldering flux/paste and soldering with plenty of heat. Joints made in this way seldom break. Note the jig made to position the struts during soldering.



The tailwheel can be mounted directly on the air rudder, as shown here. If you use this mounting method, be sure the rudder hinges are strong enough to withstand the tail weight and steering shocks.

To ensure a good fit, mount the strut assembly on the model during the soldering operation.

Single wire struts work very well and are easily made. Two separate struts are used. The fuselage cross wires are side by side in a groove that crosses the fuselage bottom, and they are held in the groove with flat landing-gear clips. The fuselage ends of the struts are bent at a right angle and are positioned in hardwood blocks that are attached to the inside of the fuselage. The cross wires act as torsion-bar springs and help to smooth the landing shocks that are transmitted to the fuselage.

The wheels should turn freely and smoothly. If necessary, use a piece of brass tube as a bushing to ensure a good fit. A wheel collar can be used on the inner side of the wheels so the wheels don't bind on the wire's curve. My favorite solution to this problem is to solder a 1/4-inch-o.d. washer to the axle inside the wheels.

Flat metal struts do not have this problem. Several commercial axle fittings or machine bolts work quite well. Be sure to use locknuts, at least on the outside of the wheels, if you use a bolt to retain the wheels. Wheel collars work best if you file or grind a flat on the axle. Even cup-head setscrews soon work loose if they are against a round surface. A neat way to retain the setscrews is to stretch a short piece of fuel tubing over the collar. This is not a guarantee but works well if the setscrew end is slightly above the collar. Landing-gear-strut drag can be lessened by adding fairings to the struts and pants to the wheels to make them more streamlined. In addition to commercially available pants, many articles and how-to's on wheel pants have been published. Shaped balsa, formed plastic and fiberglass pants all look good and work well. Commercial hardware is available to ensure that wheel pants remain aligned after landings and takeoffs.

A "SCRATCH" NOTE

Electrician's crimping pliers have provisions for trimming the lengths of bolts. The trimming is done without leaving messy threads as happens when you use a saw or diagonal pliers to do the cutting. Bolts from 4-40 to 10-24/32 can be trimmed.

LANDING GEAR CONSTRUCTION NOTES

- Cut music wire by notching it with a file or a grinder and breaking it off. A Dremel or a similar hand grinder works well.
- Bend wire and aluminum sheet with generous radiuses to minimize the stress in the material. Use a wire bender (K&S* makes a good one) or soft-jaw inserts in your vise.
- Cut sheet aluminum with a bench saw using a carbide-tipped blade. Wear safety glasses.
- Smooth the edges of aluminum with sandpaper. Wire ends can be smoothed with a fine file or a grinding wheel.
- If you lack the confidence to work with wire and/or sheet metal, buy secondary parts from a company that sells parts for its kits (check out Goldberg* and Sig*).

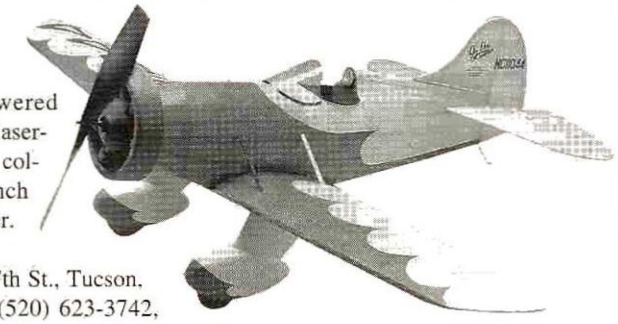
Landing gear is a very important part of a model airplane, whether it's a single wheel or a scale copy of the real thing. Stay tuned; in my next column, I'll discuss skis and floats. These types of landing gear extend your flying possibilities to flying from lakes and even into the winter.

Please send your scratch-building questions and comments to me at 82 Frazier Way, Marstons Mills, MA 02648, or email me at geowilson@juno.com.

Addresses are listed alphabetically in the Index of Manufacturers on page 126.

LATEST PRODUCT RELEASES

DUMAS PRODUCTS
Gee Bee Model E



This 30-inch-span, rubber-powered model kit includes more than 70 laser-cut parts, vacuum-molded parts, colored tissue, color decals, a 9-inch plastic prop and FAI Tan II rubber.

Part no.—302; **price**—$36.95.

Dumas Products Inc., 909 E. 17th St., Tucson, AZ 85719; (800) 458-2828, or (520) 623-3742, fax (520) 620-1329; email: dumas@azstarnet.com.

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Model Airplane News is interested in showing our readers your new products—here in Product News. If you'd like to see your products here, send us a clear photo and a press release that provides information about your product! We'll publish as many as space permits.

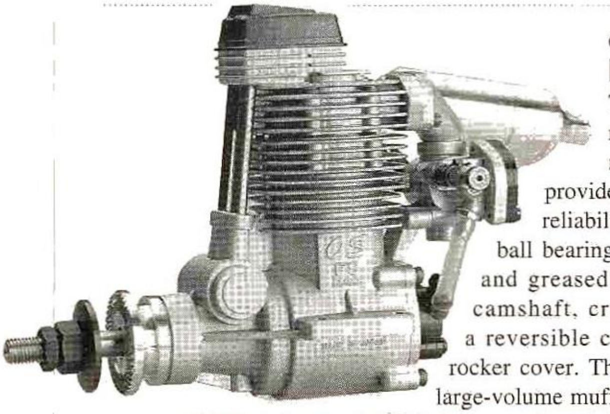
Send your announcements to: Product News, Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606.

AMERICAN EAGLE
De Havilland Hornet F Mk. 1

Available in 1/7 and 1/5 scales, these models feature epoxy/glass fuselages and nacelles, foam wings, canopies and plans—no wooden parts. Specifications: length—60/88 inches; wingspan—81/108 inches; wing area—1,100/1,600 square inches; weight—16 to 20/30 to 35 pounds. Call American Eagle for more information on other WW II aircraft kits.

Prices—$425 (1/7 scale), $625 (1/5 scale).

American Eagle Model Aircraft Co., 4608 Chastant St., Metairie, LA 70006; (504) 455-5487.

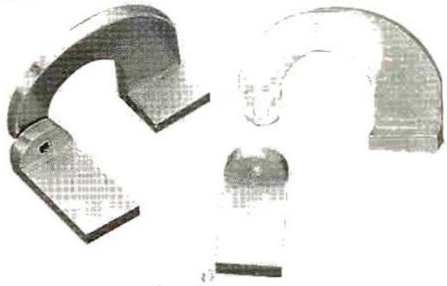


O.S. ENGINES
FS-91 Surpass II

The powerful FS-91 is now available with a new regulating fuel pump that provides better response and greater reliability. It still comes with a rear ball bearing that's sealed on both sides and greased internally; plating on the camshaft, crankshaft and piston ring; a reversible carb; and a black-anodized rocker cover. The engine also comes with a large-volume muffler. Specifications: displacement—0.912ci; bore—1.197 inches; stroke—1.083 inches; practical rpm—2,000 to 12,000; output—1.6b.hp/11,000rpm; weight—32.5 ounces.

Part no.—OSMG8090; **price**—$529.99.

O.S. Engines; distributed by Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300, fax (217) 398-0008; website: www.osengines.com.



BOB FIORENZE
Gear-Door Hinges

These large-scale, heavy-duty hinges are made of aluminum and are extremely light, strong and inflexible. Send $3 for an illustrated catalog of other available products.

Price—$2.95 each.

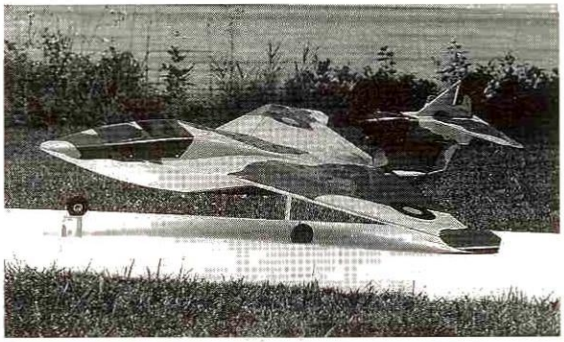
Bob Fiorenze, P.O. Box 953042, Lake Mary, FL 32795; (407) 330-1448.

BALSA USA
Northstar

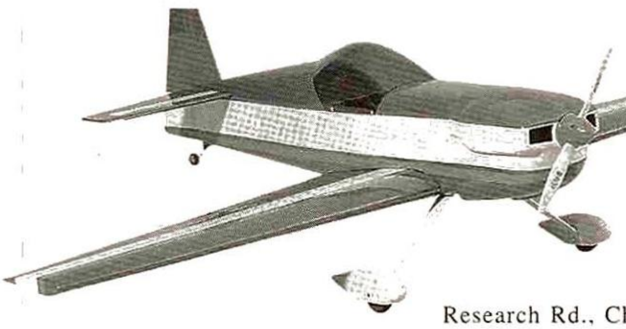
A floatplane that accelerates quickly on the water and lands slow and easy, the Northstar is stable yet quick and agile. The kit comes with full-size rolled plans, die-cut and jig-cut balsa, plywood and lite-ply parts, a decal set, ABS cowl, hardware (including optional landing gear) and illustrated instructions. Specifications: wingspan—44 inches; wing area—750 square inches; length—54 inches; weight—6½ pounds; engine recommended—.40 to .46 2-stroke.

Part no.—455; **price**—$97.95.

Balsa USA, P.O. Box 164, Marinette, WI 54143; (906) 863-6421; fax (906) 863-5878.



Product **NEWS**



KYOSHO

CAP 232 ARF

This .40-size model is made of durable, lightweight balsa covered with a high-quality, repairable heat-shrink film. Its wheel pants and ABS cowl are painted to match the color scheme. Specifications: wingspan—55 inches; wing area—558 square inches; weight—5.3 pounds; fuselage length—49 inches; engine required—.32 to .40 2-stroke or .48 to .52 4-stroke; radio required—4-channel with four servos.

Part no.—KYOA1040; price—$269.99.

Kyosho; distributed by Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300, fax (217) 398-0008; website: www.hobbies.net/kyosho.

THE WOOD CENTER

Red Baron Riding Toy

One- to three-year-old pilots are sure to be pleased with their very own airplane. This kit comes with everything you'll need to build the toy, including sandpaper, stain, wax, hardware and decals. All wooden parts are CNC-router cut and have been sanded and rounded to eliminate splinters and speed assembly, which should take one hour (plus finishing).

Price—$119.95.

The Wood Center, 2085 Sage Rd., Medford, OR 97501; (541) 734-7460.

MEGATECH CORP.

Power Center 12V Control Panel

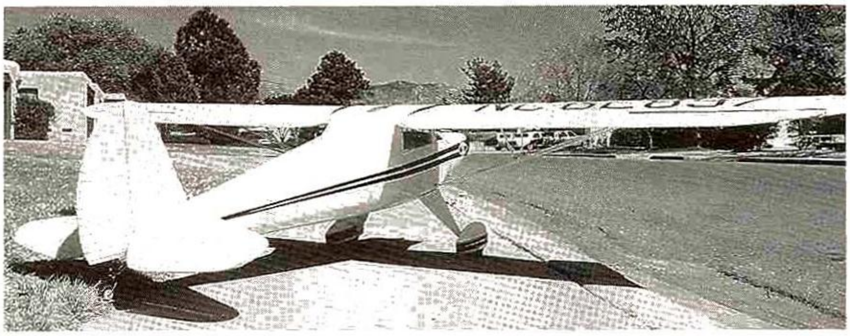
This unit controls all essential field equipment from a single 12V source. Accessory outlets include a 12V electric starter; 6V or 12V electric fuel pump with panel-mounted controls; and an adjustable, variable-pulse 1.5V glow driver. A panel meter allows you to monitor the plug and the engine. The 6x3-inch panel comes with banana plugs, alligator clips and complete instructions.

Part no.—MTC1170; **price**—$21.95.

Megatech Corp., P.O. Box 32, North Bergen, NJ 07047; (201) 662-8500; fax (201) 662-1450; website: www.megatechrc.com.

PAT'S CUSTOM MODELS

Luscombe 8A



Plans, fiberglass cowl and wheel pants are now available for the 1946 Silveraire. The ¼-scale, IMAA-legal design has a wingspan of 103 inches, features scale ailerons and simple construction and is a very scale-like flyer on an O.S. .91 Surpass. Visit Pat's website or send an SASE for a complete catalog of available plans and accessories.

Prices—$29.95 plus $6 each S&H (plans, cowl and pants), $84.95 plus $10 S&H (total package).

Pat's Custom Models, 10313 Snowheights Blvd. NE, Albuquerque, NM 87112-4511; (505) 296-4511; website: www.geocities.com/Eureka/Plaza/1219.

Descriptions of products appearing in these pages were derived from press releases supplied by their manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Model Airplane News**, nor does it guarantee product performance. When writing to the manufacturer about any product described here, be sure to mention that you read about it in **Model Airplane News**. **Manufacturers!** To have your products featured here, address the press releases to **Model Airplane News,** attention: Product News, Air Age Inc., 100 East Ridge, Ridgefield, CT 06877-4606.

CLASSIFIEDS

BUSINESS

WWW.COPTERCORNER.COM, a full-service R/C helicopter site since 1978. Email: helifly@best.com. [8/98]

PAYING $250 EACH for following toy metal outboard boat motors: Gale Sovereign 60hp, Oliver, Black Mercury MK-1000, Seafury Twin. Gronowski, 140 N. Garfield Ave., Traverse City, MI 49686; (616) 941-2111. [8/98]

FUTABA 2-CHANNEL (AM) RECEIVERS, $19, crystals $9, 3003 servo $9; Sport Racing Battery Pak, 7.2V 1500mAh, $9.99; 7.2V 1400mAh, $9.49; Futaba MC210CB speed control, $44.95; shipping and handling $3; add $3.50 for C.O.D.s. Mail to Southside Hobbys, 8181 E. Old Ft. Harrison, Terre Haute, IN 47803. Call (800) 782-4164. Mastercard/Visa, money orders accepted. [6/98]

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MARK'S MODEL BUILDING will build your R/C aircraft. Quality workmanship. Reasonable rates. Completely finished or ready to cover. Mark will build most sport models from Midwest, Great Planes, Top Flite, Sig and Goldberg. Sport planes are his specialty. Mark also offers his own designs, custom built: a 1/4-scale, 61" wingspan Pitts Special, weight 9½ lb.; an 80" Sukhoi SU 29, weight 10½ lb. Call or write for a price quote. Mark Sirianni, 133 Bayard St., Kane, PA 16735; (814) 837-9435. [8/98]

BIG COMBINATION BUILDING AND CUTTING BOARDS, sizes 24x36 through 40x72 in. Heavy-duty mats are pinnable and withstand heavy use of rotary cutters and X-Acto blades, kits, or plans. Shelfmaster/Tony Sengo, 13408 Apple Rd., Wilton, CA 95693; website: www.elkgrove.net/shelfmaster. [6/98]

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INTERNET: www. 1stbooks.com. New book: Rudi The Family's Nightmare, $4.95. Incredible adventures for young and old. Dynamite! [9/98]

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GIANT-SCALE PLANS BY HOSTETLER. Send SASE to Wendell Hostetler's Plans, 1041 Heatherwood B, Orrville, OH 44667. Phone (330) 682-8896; fax (330) 683-5357; http://www.aerosports.com/whplans. [6/98]

SODA-CAN AIRPLANES—replica biplane detail plans with photos, $7.50 PPD. Early's Craft, 15069 Valley Blvd. SP 26, Fontana, CA 92335. [8/98]

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REARWIN "CLOUDSTER," GEE BEE RACERS, others. Many sizes. PLANS catalog/newsletter, $4. Vern Clements, 308 Palo Alto, Caldwell, ID 83605; (208) 459-7608. [7/98]

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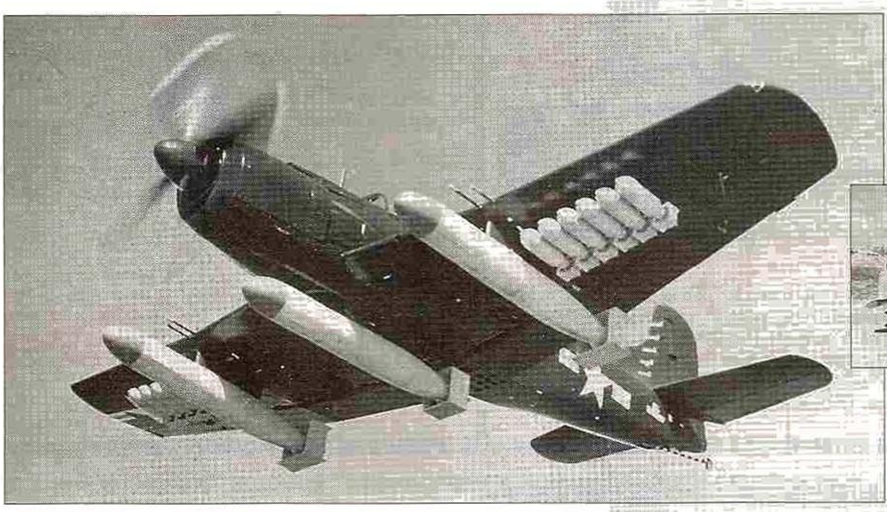
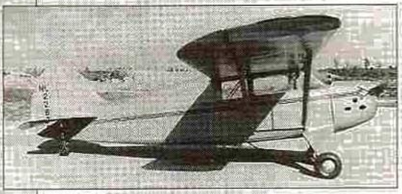
Name THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?



Congratulations to William Drennan of Ottawa, Ontario, Canada, for correctly identifying the March 1998 mystery plane. The Akron Aircraft Inc. Funk B



had a 35-foot-span, fabric-covered wing and a 20-foot-long, welded steel tube fuselage. The aircraft was originally powered by a Ford car engine—a highly modified 4-cylinder, inverted, in-line powerplant. The Funk B had a maximum speed of 110mph, a cruising speed of 100mph and a range of 400 miles.

Send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 100 East Ridge, Ridgefield, CT 06877-4606.

The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to *Model Airplane News*. If already a subscriber, the winner will receive a free one-year extension of his subscription.

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3 Sea Bees Models, P.O. Box 747, Lake Stevens, WA 98258; (425) 334-6089.

Aeroloft Designs, 2940 W. Gregg Dr., Chandler, AZ 85224.

Aeronaut; distributed by Hobby Lobby Intl. (see address below).

Aerospace Composite Products, 14210 Doolittle Dr., San Leandro, CA 94577; (510) 352-2022; fax (510) 352-2021.

Air Champ Models Inc., 801 S.W. 3rd Ave., 3rd fl., Miami, FL 33130.

Airtronics, 1185 Stanford Court, Anaheim, CA 92805; (714) 978-1895; fax (714) 978-1540.

American Hobby Products, 12 West Hill Cir., Reading, MA 01867; (617) 944-8316.

APC Props; distributed by Landing Products, P.O. Box 938, Knights Landing, CA 95645; (916) 661-6515.

ASP; distributed by Hobby Lobby Intl. (see address below.)

AstroFlight Inc., 13311 Beach Ave., Marina del Rey, CA 90292; (310) 821-6242; fax (310) 822-6637.

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Balsa USA, P.O. Box 164, Marinette, WI 54143; (906) 863-6421; fax (906) 863-5878.

Bisson Custom Mufflers, RR 1 Taits Island, Box 32, Parry Sound, Ontario, Canada P2A 2W7; (705) 389-1156; (705) 389-1156.

Bob Holman Plans, P.O. Box 741, San Bernardino, CA 92402; (909) 885-3959; fax (909) 889-9307.

Bob Parkinson Flying Models, 1140 Early Dr. N.W., Palm Bay, FL 32907; (407) 726-8401; fax (407) 725-3381.

Bob Violett Models (BVM), 170 State Rd. 419, Winter Springs, FL 32708; (407) 327-6333; fax (407) 466-3683.

Brison Aircraft, 12075 Denton Dr., Ste. 11, Dallas, TX 75234; (214) 241-9152; fax (214) 241-5065.

Byron Originals, P.O. Box 279, Ida Grove, IA 51445; (712) 364-3165; fax (712) 364-3901.

Carl Goldberg Models, 4734 W. Chicago Ave., Chicago, IL 60651; (312) 626-9550; fax (312) 626-9566.

C.B. Tatone Inc., 21658 Cloud Way, Hayward, CA 94545; (510) 783-4868; fax (510) 783-3283.

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Great Planes Model Distributors, 2904 Research Rd., P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-1104; website: www.hobbies.net/dynaflite.

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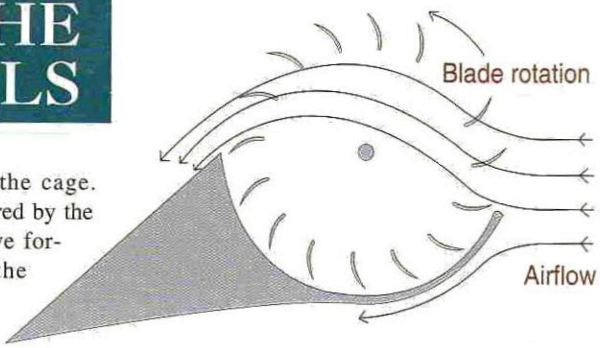

PHOTOS BY PAT PEEBLES

THE REAL DRIVING FORCE behind my cross-flow fan wing is a passion for doing things differently that has plagued me my whole life; this time, it may have produced something quite useful. I am an American citizen and a resident of Rome, Italy, where I have lived most of my life. I have a passion for all the different aspects of flight and have done a fair amount of gliding. This idea hit me a few years ago as a hunch. Although I am not really a modeler, I built this model to prove to myself (and, I hope, to some other people) that this wing is a viable alternative to the traditional ways of getting off the ground.

This flying model was made as a test bed. It started out as a hunch: the picture in my mind was that of a paddle-wheel rotor embedded in the top of a wing. I tried many different wing geometries before I got to the one shown here.

The rotor on the wing is powered and gives both lift and thrust. As the rotor turns, the air is accelerated twice—once as the blades rise and once as they fall toward the trailing edge. There is also a third effect that is fundamental to the efficiency of the wing. A high-speed vortex forms off-center in the lower half of the cage. The vortex is powered by the blades as they move forward; the top of the vortex drives the airflow.

The flying model weighs 4 kilograms (nearly 9 pounds) and has a wingspan of 2 meters (6½ feet). Powered by a .32 O.S. helicopter engine at about ⅓ power, it gets off the ground at around 20 kilometers per hour (12½mph). The wings have rotors of 80mm (3.2-inch) diameter that run the full length of he span.The rotors have 16 blades slightly inclined and curved. A 3-channel radio controls rotor speed, elevator and leading-edge flaps. These flaps (not shown here) act as ailerons; they cut off the input air from the rotor, and that reduces both lift and thrust. This gives a turn without yaw.

The wing was first tested at the end of a boom and allowed to swing a full circle. I then measured power input, rpm, lift and speed. This was my main development test rig.

A model has been tested in the wind tunnel at the University of Rome. This was a very short wing section with a 160mm (6.4-inch) diameter rotor. One end was transparent to allow the airflow to be seen with smoke injection. These tests showed us the position and nature of the vortex. They also showed that the flow is not organized until a certain air speed is reached. The wing presently does not have a very good thrust while standing still. As it gains speed, the flow becomes organized, and the efficiency of the fan increases dramatically. When at speed, the wing takes in air at the full exposure of the fan; this air is accelerated by a factor of 3 and ejected at 45 degrees down over the trailing edge.

I am now working on improving the static thrust and the overall efficiency. The efficiency of the model wing is about 14 grams (5 ounces) of lift per watt of input power. A new model is being made for wind-tunnel testing; it has essentially the same rotor but a different shape under the rotor, and this increases the vortex speed. This should be ready for testing in a couple of months.

I am also designing a new flying model with an improved wing section. This will have a single wing with an electric motor, batteries and radio inside the triangular leading edge. For control, it will have only rotor speed and leading-edge flaps (ailerons).

As a full-size airplane, I see this as a flying truck. It would be slow and have a very good lift-to-power ratio. It would also be very quiet. A patent application is pending, and I am looking for funding and collaborators to further the development. Anybody interested in helping? I also plan to build more flying machines using this type of wing and have managed to increase the static thrust/lift to a point at which it may be possible to manage vertical takeoff. Visit my website at www.freetec.com/span/welcome.htm to keep up to date on the development.

—*Pat Peebles*